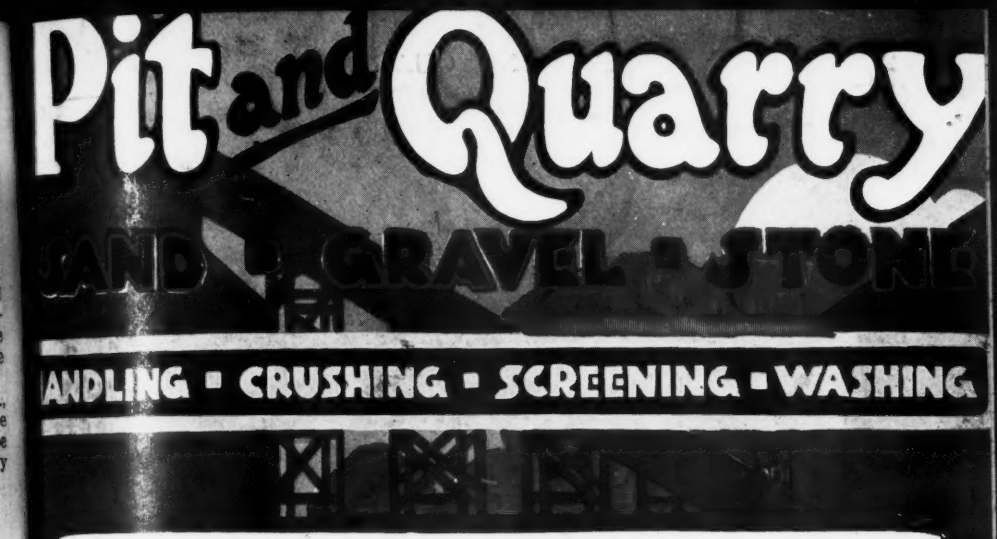

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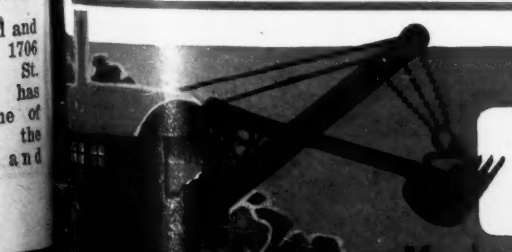

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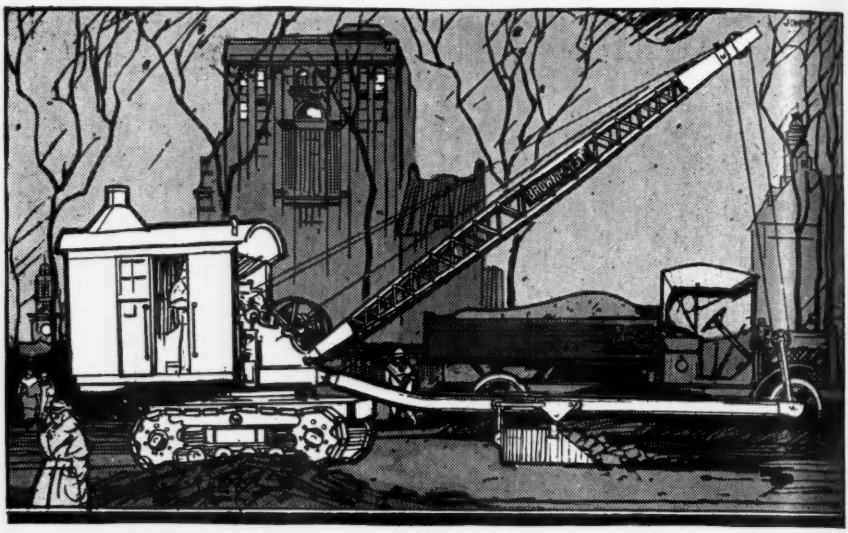

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VOL. 6 CHICAGO, ILL. JULY, 1922 NO. 10

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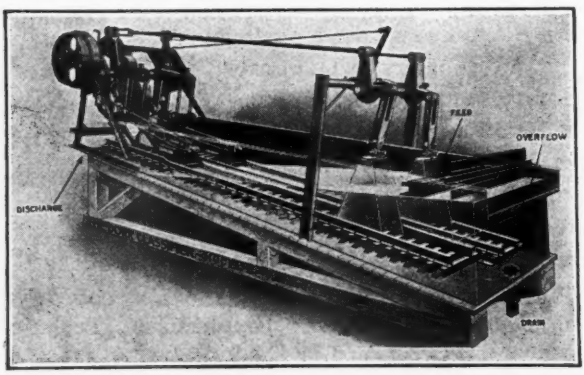

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Pit and Quarry

Vol. 6 Chicago, Ill., July, 1922 No. 10

Pumps for Stripping

By DANIEL J. HAUER

GRAVEL banks, sand deposits and quarries frequently have a heavy overburden on them, that must be stripped before deposits can be worked. This overburden frequently consists of clay, boulders, rotten or decomposed rock and other worthless materials or earths.

There are various methods of stripping these banks; but one, when it can be used, is far cheaper than any other, especially should the overburden be heavy. This is the hydraulic method, by means of a pump and a nozzle, or giant, or monitor, as it is sometimes called.

There are certain limitations to the use of this method. First, there must be an ample supply of water. Second, the use of water must not interfere with the other operations or injure any of the machinery. Third, there must be ample ground available to receive the deposit of excavated material and water, and arrangements must be made to hold the earthy materials in place in the dump and allow the water to drain off without injuring adjoining property. Fourth, the amount of overburden must be such as to justify the initial cost of the equipment to do the work.

The cost of such equipment can vary considerably. A simple layout of pumps and pipes can be used in some cases, for the water may not have to be raised to any great height, and the material after it is loosened may have a steep hillside to flow down, while in other cases the pumps may have to raise the water to a considerable height, besides carrying it a great distance and have the water available for use at several places and all the excavated material and the water may have to be carried away in troughs, etc.

Then too it must be remembered that if the plant is to be used for stripping alone, it may be used for a few days in the year, or possibly only a few weeks or a month, and then be idle for several years, for it is possible to strip a large area in a short time and in a few weeks or a month sufficient ground may be stripped to open a deposit where operations can be carried on for two or three years.

In spite of these facts, as previously stated, stripping by hydraulic method, including all costs—even that of overhead—can be done in many cases much cheaper than by any other method, frequently for less than five cents per cubic yard.

First of all, the pump used must be a high pressure one, for there must be sufficient pressure to cut loose the earth and boulders and rock and turn them over to roll away. Then the pump should furnish such a volume of water as to be sufficient to carry the excavated material away. The percentage of earth, etc., carried in water will seldom be more than 50 per cent and in most cases will be much less

—often as low as 25 per cent and less. Consideration must be given to the fall in the pipe or troughs that carry off the material.

Naturally the nozzle or monitor, its size and type, play a part in all of this work, but the pump is all important and it is this that is being considered at this time.

The duplex pump can be used for this kind of work as well as a triplex; but the ordinary pump of these two types used for boiler feeding and draining pits or for similar work is not adapted to furnishing water with the necessary pressure for hydraulic stripping. The pumps used must be high pressure ones and of such size as to throw a large volume of water. For these reasons it is sometimes necessary to use several pumps discharging into a single pipe line.

Another item to remember in selecting pumps is the height to which the water may have to be lifted. Stripping work is on top of a bank or ledge, while the water supply is generally at a much lower elevation so that the water may have to be raised or elevated as much as 200 feet. With the smaller size pipes this means that the resistance and friction against the sides of the pipe materially reduces the pressure of the water at the nozzle.

Centrifugal and rotary pumps are also used for hydraulic stripping. These are the same types of pumps as are used on dredges. For less money invested and for a smaller size pump they throw a much greater volume of water, and this is a decided advantage, but the pressure is not as great as with other types of pumps. The centrifugal pumps will raise water a considerable height.

A great advantage that these pumps have over any others is the fact that they will pump water laden with mud, clay, sand or gravel, while the duplex and triplex pumps must have clean water. Thus the centrifugal pumps can be used when water is obtained from small streams and from dirty pits.

Then too if the water once used for stripping is run back to the pump supply, even if it is laden with mud it can be used over again with the centrifugal pumps, and when water is scarce this is a decided advantage.

These are the general type of pumps used for hydraulic stripping. There are some cases where pumps are not necessary. In mountainous country a supply of water can sometimes be found at higher elevation than the stripping area. If the fall is sufficient then the water can be piped to the site of the stripping and sufficient pressure can be obtained to do the work.

The first hydraulic work of this kind the writer ever did was in the Rocky Mountains, where water was piped from an elevation a thousand feet higher than the hydraulic sluicing, so that a pressure was obtained that loosened and moved boulders containing more than 2 cubic yards. The plant cost for such work was small, consisting of the pipe and monitor only, and the troughs to carry the excavated material and water away.

M. O. C. Hubbard, executive Secretary of the Wisconsin Mineral Aggregate Association, is resigning his position with the Association, effective July 1st. Mr. Hubbard will be affiliated with the Janesville Sand & Gravel Company.

The plant of the Canadian Crushed Stone Corporation, Dundas, Ontario, has been practically destroyed by fire. Col. C. M. Doolittle, who has charge of the plant, is working night and day, however, to get the plant in operation again at an early date.

The Barry Sand & Gravel Co., have recently opened up a new plant at Barry, Ill. Glen McNeal is manager, and Floyd Woodward will be operator. the plant will give steady employment to six men.

Dredging Plant Combines Novelties

A NUMBER of new departures in methods of producing washed and screened sand and gravel, characterize the dredging plant of the Belmont Sand and Gravel Company, located at Belmont, Michigan, some seven miles from the city limits of Grand Rapids on the Northern division of the Pennsylvania System. This company recently organized, has offices in the Commercial Savings Bank Bldg., at Grand Rapids. The president, Mr. Maurice Sluyter, one of the leading spirits in the inauguration of the enterprise, was formerly engaged in the real estate business and still has extensive real estate interests in and around Grand Rapids. Mr. I. R. Blandford, secretary, is also plant manager. Mr. Blandford, a technically trained man, has had considerable experience in the production of concrete aggregate, and is well qualified to take charge of the operations at the Belmont plant.

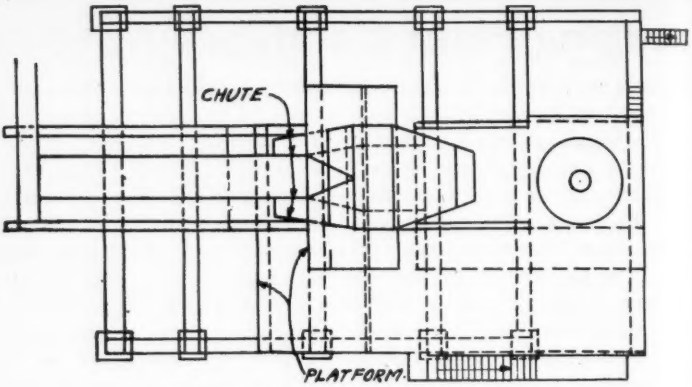
The plant at Belmont represents an investment of $150,000, including the value of the land that the company controls and the cost of the well equipped dredging and screening plant. It is estimated that deposits of gravel on the land controlled by the company will run between 5,000,000 and 6,000,000 tons, sufficient to secure a 60 year supply with the work continuing seven months of each year.

The deposit that is being worked by the Belmont Company lies in a country that is full of springs and has, consequently, an ample supply of water, always available. The ground about the plant is very firm and dry but it is necessary only to dig down a few feet to strike plenty of pure clear water, containing very little mineral matter and entirely fit to drink. This feature makes the section an ideal one in which to carry on hydraulic operations.

The gravel deposit which the company will work is made up of quite hardly compacted material running about 40 per cent to gravel and 60 per cent to sand. There is a large amount of oversize; about 10 per cent of the total material might be a fair estimate. The deposit contains but little clay and silt, and these are disposed of very easily by the washing operation. The principal problems before the producers were those of keeping the gravel loosened up sufficiently for dredging, and providing a means for keeping very large stones out of the operation.

The first piece of equipment in the plant, the dredge, offers a visitor a number of things to think about. The scow is 60 feet by 35 feet, built of wood a little more staunchly than usual. It has roomy, well lighted interior, with the power, pumping and accessory equipment conveniently arranged. Plenty of room has been left around each piece of machinery, a bit of forethought that will prove worth while at any time that it is necessary to make repairs. At the stern is located a 500 gallon water tank which, with its other uses, will help to counterbalance the heavy A frame and the traveling cutter which it will suspend. Apparently the design of the dredge will insure its floating evenly when all the equipment is in place and operations have begun.

The notable feature of the dredge is its power plant, a 225 horsepower, 4 cylinder, 14x18 inch, 4 cycle Type K Anderson oil engine operating at 250 r.p.m. This engine is mounted on a substantial concrete foundation built upon heavy timbers running to the sides and ends of the scow and effecting an even distribution of the total weight. To the left of the engine is a 60 inch pulley driving a jackshaft to which the priming pump and the hoist for the A Frame and suction nozzle are belted. To the right is a 14 inch pulley for driving an air compressor



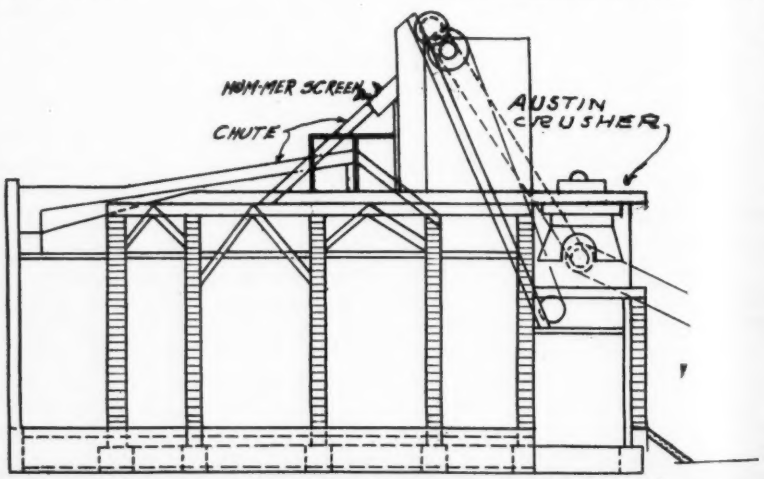
Plan View of Screening and Crushing Plant

and a water pump for cooling the engine.

The pumping equipment at present consists of a 10 inch Amsco pump, which does not, of course, require anything near the capacity of the engine, but which may later be worked with other similar equipment to deliver the material that the screening and crushing plants are designed to handle. This pump will raise the material 45 feet to the top of the screening plant, passing it first through about 200 feet of pipe, as figured from the present position of the dredge. It is estimated that the output will average about 20 per cent solids.

Suspended from the A Frame, which is 25 feet high and heavily constructed, will be a Swintek traveling cutter. This device will serve to keep the gravel under the nozzle loosened up and will also act as a grizzly to prevent very large stones from finding their way into the pumping system. The cutter is 35 feet in length and is equipped with manganese steel teeth. It is driven from a 42 inch split pulley by a 7 inch belt running from a 22 inch pulley on the jackshaft. The correct running speed is obtained by 2 spur gears located close to the driving pulley of the cutter.

The raising and lowering of the A



Side Elevation of Screening and Crushing Plant. Note Bin Walls.

frame and the cutter with its built in nozzle are accomplished by a 3 drum special belted hoist made by the American Hoist and Derrick Company, This piece of equipment is operated at 450 r.p.m. and controlled by levers located at a point that gives the operator a full view of the mechanism outside the dredge. Power is obtained through an 8 inch belt to the jackshaft.

The rest of the equipment on the dredge consists of priming, bilge, cooling and fire pumps, an air compressor, and a small auxiliary oil engine used for driving the compressor.

The priming of the 10 inch Amsco dredging pump and the pumping out of bilge water are managed by a Fairbanks-Morse 5x5 inch Typhoon pump. It is the intention of the management to utilize it also as a fire pump. A fire hose is at all times coupled up and it requires only the manipulation of a few valves to secure a stream of water sufficient to put out any fire that may occur on the dredge. This precaution has already gained a more favorable insurance rate and another advantage of reduced fire hazard is also gained, the practical guarantee against interruption of production on this score. This general purpose pump is driven by a 3 inch belt from the jackshaft.

Water for cooling the big oil engine is supplied by a 6x10 inch Typhoon pump driven by a 3 inch belt from a 14 inch pulley to the right of the engine. From the right of the engine is also driven a 3¼x4½ inch 2 cylinder air compressor. The compressor may also be driven by a 3 horsepower auxiliary oil engine. The pump, compressor and engine are all the products of the Fairbanks-Morse Company.

The dredging pump, driven by a 36 inch belt direct from the engine has a speed of 500 r.p.m. as against 250 for the engine. Its maximum capacity is 135 tons per hour. An Amsco 10 inch flap valve controls the flow of water and solids into the discharge line which runs underneath the deck of the scow to the stern. It will require only 2 or 3 pontoons to support the pipe line to the shore at the beginning of operations.

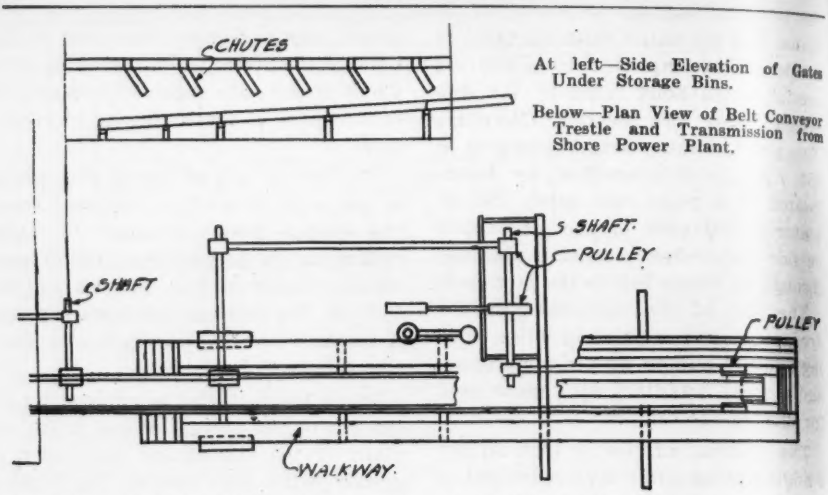
The dredge will be moved from place to place by breastlines running from the nozzle hoist through 10 inch sheaves at the bow corners to dead men ashore. Cable for this purpose will be ½ inch, for raising and lowering the A frame 1 inch. Broderick and Bascom cable will be used.

When the material is pumped up to the top of the screening and crushing plant it will be passed first over a grizzly with bars spaced 2½ inches apart. All oversize material will drop from this point to an oversize bin located above the crusher. One of the ways in which this oversize bin adds to the flexibility of the operation will be described further on in this article.

Sand and gravel that passes the grizzly will go to a bin feeding a dewatering chute and from there to an 8-foot 2-surface Hum-mer vibrating screen. At present this screen is equipped with sections having openings 3/16 inch, ⅜ inch, ½ inch and 1⅛ inch. The product will be sized ¼ to 1 inch, ¼ to 2½ inch and ⅛ to ⅜ inch. These sizes, together with the sand, constitute the materials for which there is a ready market around Grand Rapids.

Sand will be secured from the water by passing the two through a long flume arranged with sections of baffles. The heavier materials will settle into the first sections and the lighter in succeeding sections. The sand will be taken off through gates at the bottom of the sections, the water going over the top and thence through a flume to the pond in which the dredge is working.

Material that does not pass the grizzly at the beginning of the screening operation will drop to the large over-



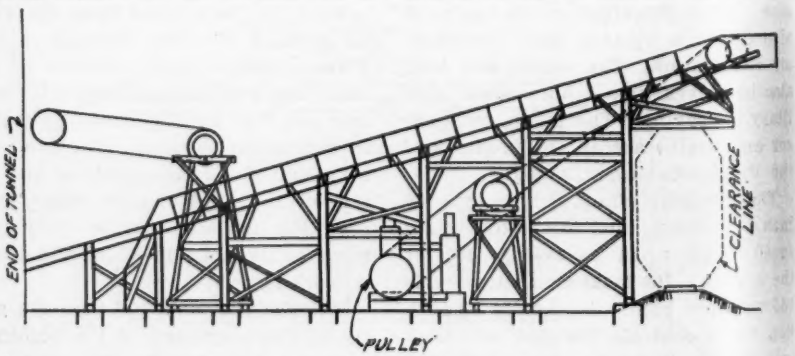
At left—Side Elevation of Gates Under Storage Bins.

Below—Plan View of Belt Conveyor Trestle and Transmission from Shore Power Plant.

size bin which is fitted with a gate at the bottom, just above a No. 4 Austin gyratory crusher. The crushed gravel dropping from the lower end of the crusher is re-elevated by a Jeffrey bucket elevator 30 feet long between centers and equipped with buckets 12 inches wide. This elevator deposits its output in the bin feeding the dewatering chute, from which point the course of the material is as described above.

The crusher was located about 20 feet above ground to make possible a shortening of the elevator which will raise its product to the top of the plant. The setting of the crusher at this height did not involve much extra labor and the advantage it gave more than justified the additional effort. Making repairs on the crusher in its elevated position will be an easy matter, too. Above the crusher there is a steel rail along which runs a chain hoist for raising and lowering repair parts.

One unique feature of the plant is its storage bins, located below the screens and sand settling flumes. The separating walls between these bins are made of 2x8 inch lumber arranged horizontally across the width of the bins and spaced 3 inches apart. Although this does not form a tight wall between sections, the materials are all kept apart. The gravel, in finding its natural slope cannot crowd through the 3 inch openings the full width of the 8 inch pieces. The sand bin, however, is sheathed over, as the sand would be able to find its way into the

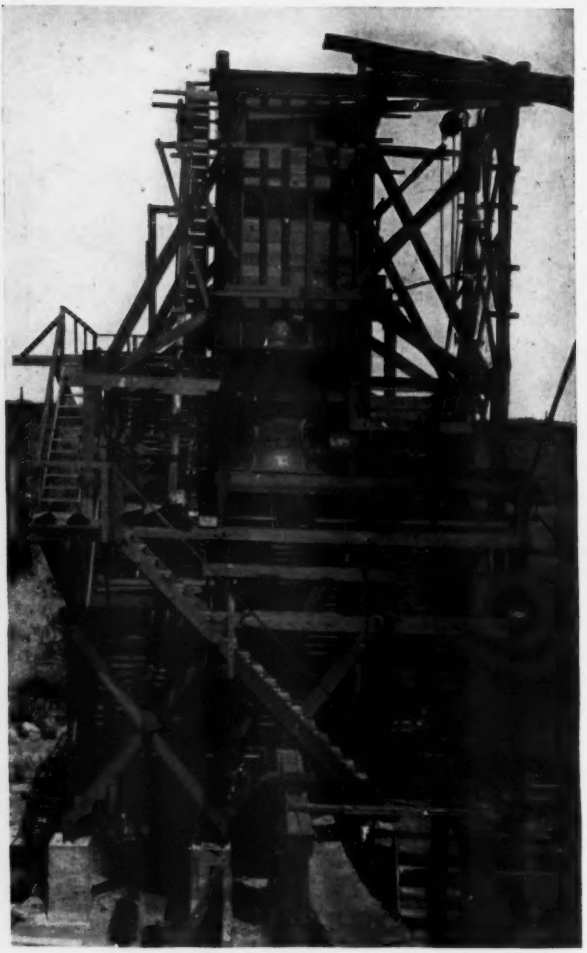


Side Elevation of Belt Conveyor Trestle and Shore Power Plant

General View, Showing How Material Progresses Through Plant

Part of Anderson Oil Engine with Pulley for Driving Amsco Pump

View of Dredge with Swintek Traveling Cutter in Right Foreground



Showing Austin Crusher, Jeffrey Bucket Conveyor and Tunnel Belt Conveyor

gravel bin adjoining. All the bins are open at the sides of the plant, as shown in the photographs.

Sand and gravel are reclaimed from these bins by a tunnel belt conveyor furnished by the Jeffrey Manufacturing Company. Material is spouted from the bins to the conveyor through Jeffrey gates as shown in one of the accompanying sketches. It is then elevated to the track bins here illustrated, from where it may be loaded at side of bottom into railroad cars or trucks. At the top of the track bins, where the conveyor discharges, is a flop gate that will divert the material flow to one of two compartments.

The screening, crushing and the loading plant are powered by a 55 horsepower single cylinder Type K Anderson oil engine,

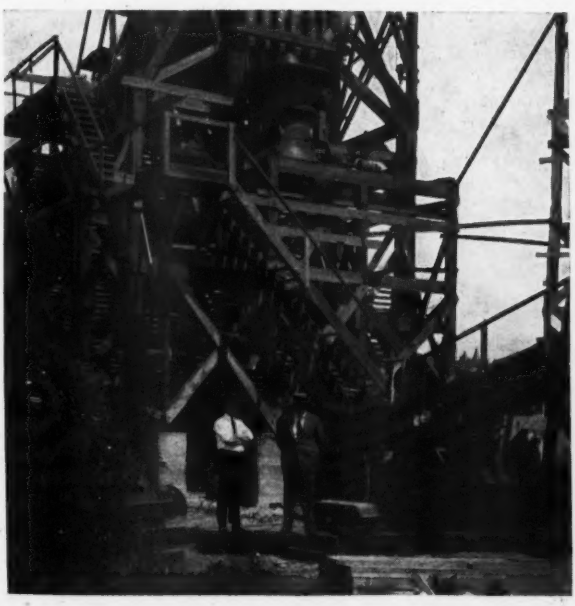
Pipe Line in Center Foreground, Tailwater Flume in Background

identically the same as any one of 4 cylinder sections of the engines on the dredge. This will make for economy in the matter of repair parts. The engine drives from a 62x10 inch pulley to a 60x10 inch pulley on a jackshaft. From a 24x6 inch pulley on this jackshaft, the Jeffrey conveyor is driven by its own 24x6 inch head pulley. This jackshaft is belted to another jackshaft, from which are driven the crusher and the bucket elevator. The Hum-mer screen is operated by an electric motor for which current is generated by a 3 horsepower oil engine.

A feature of the plant that will result in economies is that the conveyor and crusher will not be operated continuously. As the gravel comes from the dredge, the Hum-mer screen will operate continuously filling the storage bins, and the oversize will accumulate in the large bin above the crusher. When it is desired to fill the track bins with any material desired the oil engine will be started and the conveyor and crusher put in action. The accumulated oversize will be crushed at this time.

Throughout the plant Goodyear beltings used for conveying and Goodrich belting for transmission.

Screening Plant from Side, Showing Storage Bins



Mr. Blandford and Mr. Sluyter, Crushing Plant in Foreground

General View of Screening Plant. Pipe Line in Foreground.

Dredgers and Boosters in Duplicate

By VICTOR J. MILKOWSKI, Engineer in Charge of Dredge Dept.
Morris Machine Works, Baldwinsville, N. Y.

ONE of the largest and most efficient sand and gravel plants in the country is the Ward Sand & Gravel Company's plant, located at Oxford, Mich., within fifty miles of Detroit, its chief market.

Booster Pumps and Pipe Lines in Duplicate

Discharge Lines, Excavating Pumps and Pontoons in Duplicate

The plant is most remarkable in that no expense or effort was spared to make it a large and up-to-date plant, and Mr. F. L. Ward, the general manager and the guiding spirit, is to be congratulated on the success obtained.

Two fundamental guiding principles can be seen to have been followed throughout the whole installation. First, the production must be on a large scale: second, the production must be continuous and free from interruptions.

The plant is electrically operated throughout, using 3 phase, 60 cycle, 2300 volt current for the larger motors and stepping the current down to 220 volts for some of the smaller motors and lights. General Electric motors are used throughout.

The pumps are 15-inch heavy duty Morris dredging pumps, designed especially for this plant. On account of the long discharge line and the high lift, two pumps are required in each set; one pump being located on the dredge, the other, the booster pump, on shore. The most unique feature of the installation is that the pumps on the dredge, the booster pumps on shore and the suction and discharge pipe are in duplicate, which eliminates all shutdowns and interruptions on account of the pumps or pipe line. This is the only plant to the writer's knowledge where this duplication is carried out on such a large scale and, from the results obtained so far, it may well be said to have justified itself.

At the present time, the material is pumped through about 900 feet of pipe line with a lift of 71 feet above the water surface. The length of the pipe line can ultimately be increased to about 3,000 feet. The depth below the water surface from which the material is excavated is about 35 feet, and as the deposit extends to about the same height above the water surface, the total working face is about 70 feet.

The material, itself, is a very high grade sand and gravel deposit of glacial origin, practically free from clay and cemented material. Taken as a whole, the sand constitutes about 50 percent of the total, giving a considerable excess of sand. The pumps are adjusted to handle all material under 7½ inches in diameter which takes care of everything except an occasional large boulder.

The dredge, itself, is shown to the right in one of the illustrations. Originally but one set of pumps was installed; and, when duplicating the pumps and the pipe line, it was found necessary to add pontoons on both sides of the hull and in front in order to secure the additional buoyancy required.

The two dredging pumps on board are placed side by side, each being directly connected to a separate motor and with an independent suction and discharge line. The motors are 500 horsepower, 514 r.p.m., slip ring type with about 33 per cent speed reduction.

The two booster pumps are located in the building shown in the foreground of the illustration, and are similar to the pumps on board. The booster pumps are likewise entirely independent of each other. The motors driving the booster pumps are 400 horsepower, 514 r.p.m., slip ring type.

The material is delivered at the top to the right of the screening plant as illustrated in detail. The oversize material is screened out first, then crushed and delivered to the screens for classification. The gravel is screened out next and is delivered onto the screens, while the sand and water are conducted into settling boxes, where the sand is separated into different grades and is drawn off at the bottom. The waste water, together with excess sand that is not required, is returned to the pond.

The material is stored on the ground and is drawn off underneath onto a conveyor belt operating in a tunnel. The storage capacity for all the different classes of material is about 5,000 cubic yards.

The material is delivered by the conveyor belt to a loading bin, from which it is loaded by gravity into cars. The conveyor belt carrying the finished product to the loading bin should please the eye of any producer. The trough to the left of the screening plant carries the waste water and excess sand, filling in the excavation be-

View of Belt Conveyor Described in Article

hind the dredge. The dredge may be seen faintly behind the trough in the illustration.

The entire plant was overhauled and rearranged last winter, and Morris pumps were installed in place of those previously used. Since commencing operations on April 8 of this year the plant has averaged one hundred and three cars per day, the best record being one hundred twenty-seven cars. This represents a 100 per cent increase over the results obtained for the two previous seasons when the plant was operating with pumps. It must be kept in mind that the material shipped represents only about 50 per cent of the total handled. The balance is sand wasted back into the pond.

The plant is operated continuously, and averages about twenty hours per day of actual running time.

A feature of this plant deserving special notice is the installation of jet heads on the ends of the suction pipes. This feature has been tried out in a limited way on various occasions, but never on such large scale nor as thoroughly as in the present instance. Around the intake, there are provided eight ⅞-inch nozzles, which are supplied with water under a pressure of about 100 pounds per square inch. These eight jets of water issuing from the nozzle under such high pressure break up the material in front of the suction and insure a steady and a high flow of material into the pump. Another very marked advantage from using these suction jet heads is that the vacuum is held constant, in the present case at between 17 and 19. Previously this varied between 10 and 27. The favorable effect on the operation of the pump, due to this steady vacuum, needs no emphasis.

The subject with which much difficulty is usually experienced in electrically operated plants is the priming of the dredging pump. In the pre-

Another View of Screening Plant, Flume for Tail Water in Left Background

sent instance, this formerly required from five to fifteen minutes; but now has been reduced to from twenty to thirty seconds through a proper selection and operation of the equipment.

Another vexing problem with plain suction dredges is the question of oversized material. This has been solved in the present instance very satisfactorily. In each suction line, there is installed, close to the pump, a Morris stone box, which is set to pass material under 7 inches in diameter. All material over that is retained in the stone box, and is taken out occasionally, usually about twice a day. This eliminates the frequent shut-downs and the necessity of prying the stones out of the suction hose. The stone boxes are arranged so they can be easily taken out and cleaned with a minimum loss of time.

Another point about this plant worthy of note is the discharge line. This is made up of light gauge, steel plate, electrically welded Armco pipe. The plate is of a special composition, made expressly for this class of service. The life of this pipe has been far above that of the standard pipe, although it is considerably lighter and cheaper than the latter.

On the whole, this plant may, with full justice, be said to represent the high water mark in commercial sand and gravel production, and the general rule and policy followed in the installation of the plant is worthy of a close study by every producer.

The Morris equipment used throughout the plant was sold to the Ward Company by Mr. James E. Walsh, the energetic young Detroit representative of the Morris Machine Works.

Four cars of crushed stone are now being shipped daily from the plant of the Marquette Stone Products Co., the new $100,000 rock-crushing concern at Marquette, Iowa. Manager J. M. Berry is planning to increase the force so that within a short time the output will be seven cars daily.

Novel Safety Contest

Employes of Cement Plant Strive for Prizes by Eliminating Accidents

A novel contest is being staged at the Glens Falls Portland Cement Company's plant at Glens Falls, N. Y., under the direction of Frank Sansouci, safety director, the object of which is to eliminate accidents. The contestants are the employes of the ten departments of the plant, divided into ten groups, each with a chairman, who is a member of the safety council.

The contest is entitled the "safety horse race" by the employes of the company. Each department has its own horse, which is represented by a figure on a chart consisting of a number of squares. Each square represents a day. For each day in which no accident occurs in a department, the horse representing that department is advanced one day, or a square on the board. The horses have names. For instance "Wildfire" is the worthy steed which is making the race for one group of employes. Reminiscenses of the days when Glens Falls was on the racing map are furnished by the horse "Delmar."

For minor accidents, which are a little too serious for first aid treatment only, on half day is marked off and for accidents requiring only first aid treatment, the department loses one-fourth of a day in the race. If any employe receives a minor injury and fails to apply for first aid, the department is penalized.

The cement works is not a particularly hazardous place to work, but in a plant employing hundreds of men accidents will occur. Persons who have made a study of the subject claim that the human element is a strong factor in ninety per cent of the accidents and it was for the purpose of overcoming this human element problem by making a concerted drive to eliminate accidents that the company established the safety department.

The Central Silica Co., 312 Maloney Bldg., Ottawa, Ill., has been incorporated with a capital of $20,000, to mine and deal in silica sand and by-products. Incorporators: A. H. Hall, E. B. Wilkinson, R. I. Thornton.

What I Have Found Out About Lime

A Paper Given Before the National Lime Association

By F. C. MATHERS

THIS paper gives a brief summary of the most important results of the researches upon lime which were made under the fellowship of the National Lime Association at Indiana University. Mr. J. L. Hogan and Mr. K. W. Ray have done most of the actual laboratory work. Dr. Holmes and others of this association have given invaluable aid.

I have always kept in mind that there is some solution for every problem. A failure simply means that the chemist has not yet found the right things to use or the correct methods to follow. Therefore he must read more, think more and try more experiments and continue this course until the problem is solved. I still have many problems for which I have not yet found solutions. However, I have solved some problems after several years of thinking, reading and experimenting. These lime problems have been interesting to me. I hope that I have found out some new and interesting things about lime.

Settling of Milk of Lime

There are ways of slaking lime whereby the rate of settling of the hydrate is increased or decreased. A rapid settling hydrate may be made by slaking the quicklime with water containing from 0.5 to 1 per pent of calcium chloride. Other things than calcium chloride can be used but it is probably the cheapest. A slow settling lime is made by slacking the quicklime with a 0.5 to 1 per cent sugar.

With lime No. 38 (high calcium) the rates of settling for hydrates prepared in various ways is as follows:

Solution used in slaking	Volume of lime after minutes given below				
	10	20	30	60	120
Pure water	86	74	63	42	29
1% sugar	90	82	74	57	40
1% Calcium chloride	46	29	22	22	22

Other limes act in a similar way.

It is not known whether these chemical solutions will have the same action when used in slaking lime in the commercial hydrators that they had in these laboratory experiments. It seems that the results should be the same. It is thought that these chemicals in the water used for slaking have an action upon the size of the particles of hydrate. The larger particles would settle faster than the smaller ones.

Lime slaked with excess of water to a wet hydrate settles slowest of all. The presence of chemcals in the excess of water used in making a wet hydrate had little effect upon the settling.

Hydrates ground in a pebble mill settle slower than the underground hydrates.

Rate of Slaking

The rapidity with which quicklime slakes can be increased or decreased by the addition of suitable chemicals to the water. A quick lime from marble treated with an equal weight of liquids at room temperature, gave the following results:

Solutions used in slaking. Quicklime from marble.	Length of time until heat caused steam.
Pure water	12 minutes
1% hydrochloric acid.....	1 "
5% hydrochloric acid.....	¼ "
1% barium chloride.....	20 "
5% alcohol	30 "
1% Creasol	60 "
0.5% sugar	180 "

No applications were known for these interesting reactions. This retarding action of the sugar is of some importance in sugar factories where wash solutions containing sugar are used in slaking the quicklime. They always try to have hot water to avoid delay in slaking. The Steffens method of sugar recovery from molasses must depend upon this retarding action by sugar solutions.

Calcium Peroxide

Calcium peroxide, if it could be made cheaply by the direct heating of lime in air, as barium peroxide is made, would be a very valuable chemical. A survey of the literature shows that such a method is probably impossible commercially. This data is as follows:

Peroxide to be formed.	Temperature in Fahr. at which the peroxide decomposes.	Temperature in Fahr. at which the peroxide may be formed by heating the oxide.
Barium	1562	932
Strontium	716	720
Calcium	437	540
Magnesium	347	

Thus it is seen that barium is the only peroxide having a temperature of formation that is lower than the temperature of decomposition. Therefore it is necessary to use a high pressure of oxygen or air in making the strontium peroxide and still a higher pressure in making the calcium peroxide. The calcium peroxide has been made by this pressure method but there seems to be no commercial possibility in it. No catalytic agent was found in this work which lowered the temperature of formation below the temperature of decomposition.

Determination of Available Lime

The present method which is generally employed, is intended to measure only the calcium hydroxide but it may give too high a result unless the precaution suggested here is taken. In the official method the lime is partly titrated with a standard acid, is then diluted with distilled water and allowed to stand. The clear solution is then piped off and titrated to the final end point. Unless this solution has settled to a clear liquid, a high result will be obtained. This is likely to happen only with dolomites. The solution should be filtered before this final titration.

The available magnesium oxide may be determined by using one per cent ammonium chloride solution in place of pure water for the dilution described above. This dissolves the magnesium oxide that is in the free condition and is not combined with silica. No method was found for distinguishing between the magnesium hydroxide and the magnesium oxide.

An Active Quicklime and the Dehydrating of Alcohol

Hydrated lime may be reburned or changed back to quicklime by heating to 840 degrees Fahr. (450°C). The quicklime thus formed (called "reburned lime" in this paper) is very fine and is exceedingly active especially towards water. It instantly slakes with cold water and the solutions which retarded the slaking of ordinary quicklime had no apparent action on this active reburned lime. This reburned lime will instantly combine with the water in 95 per cent alcohol as shown by the quick heating while ordinary quicklime shows no apparent reaction.

A complete investigation was made of the use of this reburned lime for dehydrating alcohol. With twice the quantity of lime required for combining with the water in the alcohol, lime No. 63, at room temperature, gave the following results:

Days of contact of alcohol and lime	Percent of alcohol with Original quicklime	Reburned quicklime
At start	93.5	93.5
1 day.....	95.86	99.44
3 days.....	98.25	
4 days.....		99.49
5 days.....	98.6	
7 days.....	98.84	99.56
10 days.....	99.44	

Thus a commercially anhydrous alcohol may be obtained in one day whereas 10 days were required for the original quicklime to give an equally strong alcohol.

The results with lime No. 63, using 1.3 times the theoretical quantity of lime at room temperature, are as follows:

Time of contact in days	Percent of alcohol with Original quicklime	Reburned quicklime
At start.....	93.5	93.5
2	95.8	97.9
6	98.6	98.6
11	99.08	98.4
16	99.2	97.61

This table shows that with only a

slight excess of the lime No. 63, the ordinary quicklime is superior to the reburned. However very long periods of time are required for the reaction.

With lime No. 79 heated for one hour with the alcohol, the results were:

Quantity of lime in ratio to that theoretically needed to combine with the water	Per cent of alcohol using Ordinary quicklime	Reburned quicklime
1.4	97.37	99.68
1.5	97.46	99.8
1.6	97.46	99.8

Thus it is seen that with 1.4 times the theoretical quantity of lime, a commercially anhydrous alcohol can be gotten in one hour. It must be remembered that this lime No. 79 seemed to be especially good for this use.

The reburned limes vary in this dehydrating activity just as ordinary quicklimes vary. In all cases however the reburned quicklimes gave quicker results than the ordinary quicklimes. It is possible to dehydrate alcohol with ordinary quicklime if the action between the lime and the alcohol is allowed to run for a longer time.

It is hoped that other uses for this active quicklime will be found.

Plasticity

This ever present subject was investigated for a time along other lines than the Bureau of Standards method of fine grinding. No method of making plastic lime from the high calcium limes was found. No theory is advanced to account for the phenomenon of plasticity. It is of interest to know that hydrate ground in a pebble mill as recommended by the Bureau of Standards will settle faster than the unground hydrate which indicates that the grinding probably makes the particles denser rather than merely smaller.

No very noticable effect upon plasticity of high calcium limes was produced by—1. Slaking the quicklime with different chemical solutions and under different conditions of temperature. 2. Slaking in water vapor or steam (air slaking with both the quicklime and the water in a closed vessel) at various temperatures. 3. Partial slaking as above with the rest of the slaking in the ordinary way. It was thought that the inert material, carbonate or partly slaked lime, would make a skeleton in the hydrate just as the magnesium oxide may do in the dolomite. All of these experiments failed to give plastic limes but they led to the various new things which are described in this paper.

It was thought best to discontinue the plasticity experiments under the National Lime Association Fellowship but recently more plasticity experiments have been made independently. It is very probable that the non-plastic hydrates can be made plastic at a much lower final cost than by the method described by the Bureau of Standards.

Fineness of Hydrates

Hydrates slaked with water, with sugar solution and with water vapor (air slake) have apparent densities which decrease in the order named. The results with lime No. 71 are as follows:

Slaking agent	Apparent density
Pure water	34.2
1% sugar solution	30.4
Water vapor	27.0

It was thought that this variation might mean the magnesia was being hydrated but no method was known of proving it.

This short paper is merely a summary of the most important parts of the researches. More extended papers will be published from which the rest of the data and tests can be obtained. It is hoped that this paper will lead to discussions which will aid further research work.

The Independent River Sand Co., has been incorporated at Moundville, W. Va., with a capital of $250,000.

Becomes Lime Secretary

W. R. Phillips Begins Work With National Association

Mr. W. R. Phillips took up the duties of secretary and general manager of the National Lime Association on May 16. Mr. Phillips' college training was in the field of civil and mechanical engineering at State College, Pennsylvania. Since 1906 he has had a wide and varied experience as a sales and construction engineer. Following a year with the Government dam construction, the next six years were in sales engineering work with the General Fireproofing Company, Columbia Concrete Steel Company, and Fletcher Bro. Company, in the Western Pennsylvania territory. In 1913-16, he was with the Austin Company, at Cleveland, during the latter period in charge of the Eastern division of the construction work. In 1917, he established his own construction company with headquarters at Bridgeport, Conn., and carried on a large construction business up to the time that the business conditions of the country brought about a slump in the construction field. For the period during the war, Mr. Phillips was civilian expert on industrial production in the Ordnance Department, in charge of production of certain types of munitions.

It may be said that his experience has been more in the executive than in the technical aspects of sales and construction work, which is a phase of promotional work particularly applicable to an industry like the Lime Association, which is pushing its work along educational lines with a strong background of research and investigation. The Lime industry has made very considerable progress in the last three years through its association in

W. R. Phillips

organizing the available information about lime and its uses and getting that data into educational form for the use of the public. The future work of the association calls for a continuance of that work and especially for the active extension of its educational aspects through the development and extension of the field work in close cooperation with the technical staff in Washington.

The plant of the Bloomington Stone Crusher Co., Bloominton, Ind., was destroyed by fire June 5th, with a loss of $15,000 The company is planning to rebuild its plant at an early date.

Big Companies Merge

Charles Warner Interests Take Over American Lime and Stone

The Charles Warner Company, of Wilmington, Del., has acquired a large interest in, and assumed management of the American Lime and Stone Company, of Central Pennsylvania, whose newest plant at Bellefonte, Pa., was described in the June issue of PIT AND QUARRY.

By this step the Warner interests become the largest producers of burnt lime products for all purposes in the United States with a capacity exceeding 300,000 tons per year. The companies also have a combined capacity of raw stone products for road-making, concrete, flux, and chemical uses, exceeding one million tons per year. The value of the properties of the American Company is placed at over $3,000,000.

For years the Pennsylvania corporation has been controlled by the Morris and McLanahan interests which for various reasons wish to retire from the active direction of affairs. Mr. Morris, however, will continue as chairman of its board of directors and Mr. McLanahan as vice-president. Charles Warner of Wilmington has been elected president and Alfred D. Warner, Jr., vice-president and treasurer. Irving Warner is made a vice-president and general manager in charge of the plant and its production.

Irving Warner continues as an official of the Charles Warner Company, but discontinues active direct management. His headquarters will be at Bellefonte, Pa. He will continue in an advisory relationship to the Warner engineering and manufacturing problems and will take with him to the central Pennsylvania plant certain Warner men.

The office of general plants manager of the Warner Company is discontinued.

To cover the production and wholesale divisions of the Warner Company, there will be established two major departments to conduct, in each department, under on head, both the production and sales work of that department. These two departments will be lime products and sand and gravel departments.

Fred A. Daboll, who has been in charge of sales in Philadelphia, will come to this city and is made general manager of the lime products department. Gardner Hendrie is made wholesale sales manager for Philadelphia, and Edward B. Emory for Wilmington.

All three wholesale offices of the Warner Company in addition to handling the lime products of the Warner Company also handle the sales of the American Lime and Stone Company.

Reed C. Bye is made manager of the sand and gravel department with headquarters in this city.

Charles C. Bye is made manager of the Warner-American traffic department, which will handle the transportation problems for both companies. W. B. Hazzard will be Mr. Bye's assistant.

One of the most important adjuncts of the new organization is that devoted to canvassing, publicity, traffic, etc., which will be in direct charge of Charles Warner, chairman, Charles C. Bye, Fred A. Daboll and Irving Warner, with Ralph Dinsmore as secretary.

Roanoke Pumping Plant

Taking Out Sand Washed Down by the Current

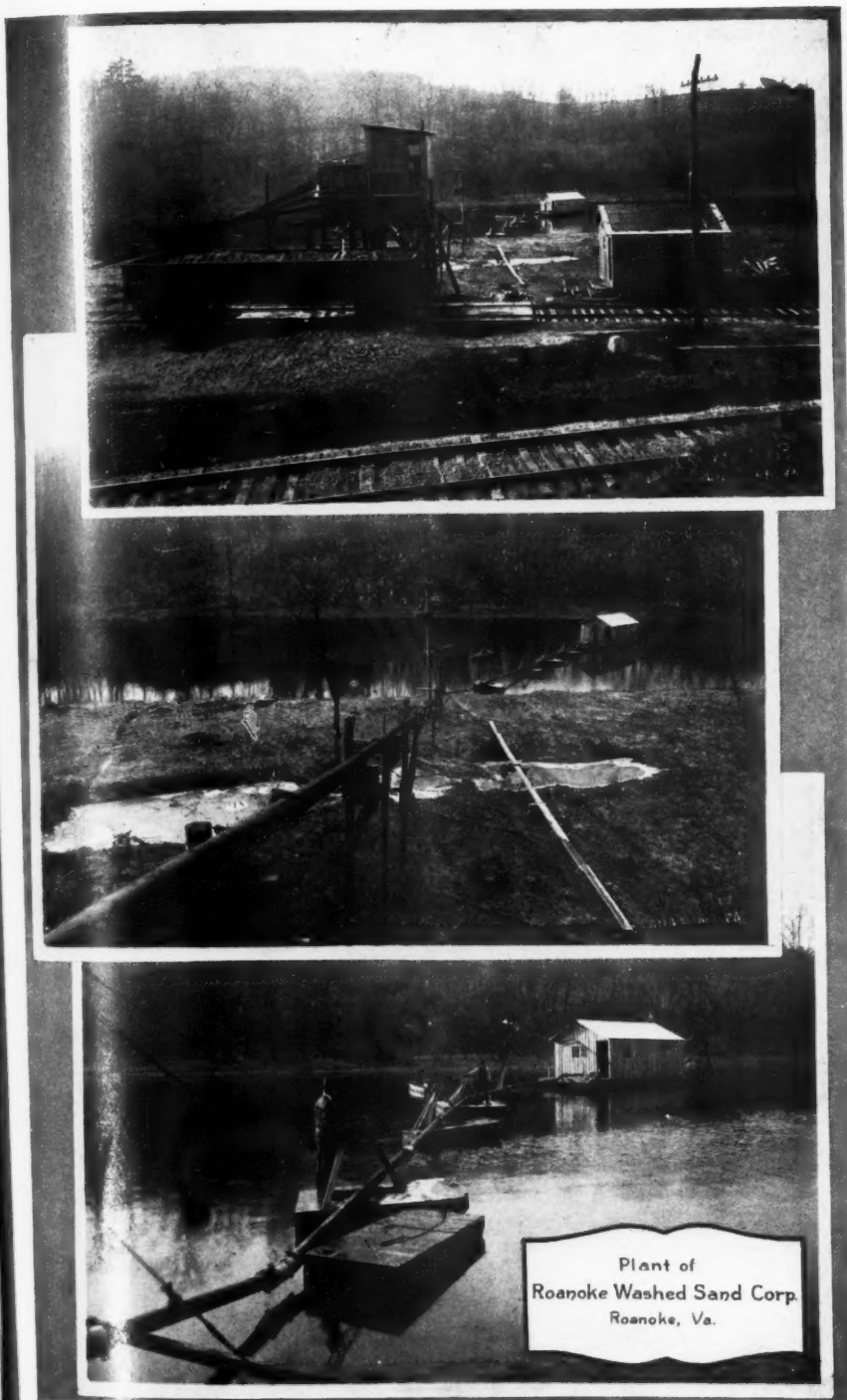
A. A. Kerns, president of the Roanoke Washed Sand Corporation Roanoke, Va., recently installed the plant shown on the opposite page.

This company was organized in the fall of 1921 for the purpose of reclaiming sand from the Roanoke Electric Power Company's dam.

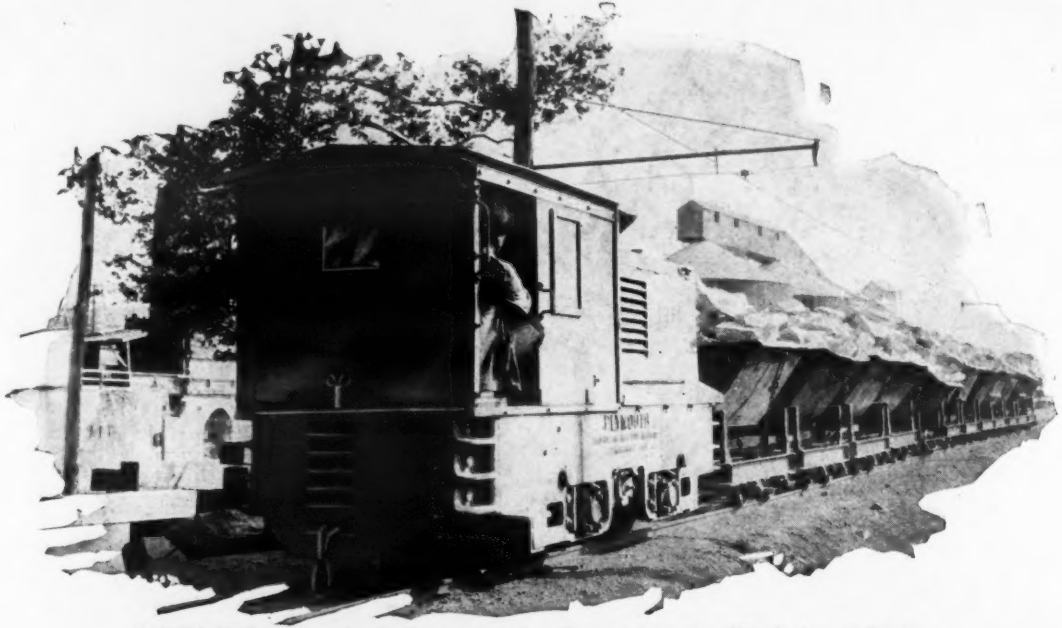
Every year large deposits of sand are washed down from various points up the Roanoke river, and deposited on the bottom of this great lake of water. To dredge this sand, Mr. Kerns installed a Morris centrifugal pump, with 6-inch pipe line, of American spiral pipe. The pump is driven by a 75-H.P. General Electric motor.

In the construction of this pipe line, particular attention was paid to the elimination of every bend possible, so that the sand could be forced through the pipe at the greatest possible speed, three 45-degree bends and one 22½ degree bend having been done away with as shown on the original plans.

In this way the pipe line can be extended up the river 1,000 feet and likewise down stream an equal distance.



Plant of
Roanoke Washed Sand Corp.
Roanoke, Va.



PLYMOUTH Locomotive in Plant of Charles Warner Company, Wilmington, Delaware.

The Plymouth locomotive shown above, handles twelve cars, each loaded with two tons of one-man quarry stone,—24 tons without weight of cars. It handles these trains readily against 4 per cent grades.

If Assembled In Convention

If all the manufactured gasoline locomotives were gathered

It handles these trains readily against 4 per cent grades.

If Assembled In Convention

If all the manufactured gasoline locomotives were gathered in convention, the PLYMOUTHS would occupy two-thirds of the seating capacity.

It is their utility that enables them to thus predominate. Pep is the only word that has the punch to describe the "pick up and snap", the "hurry and get there."

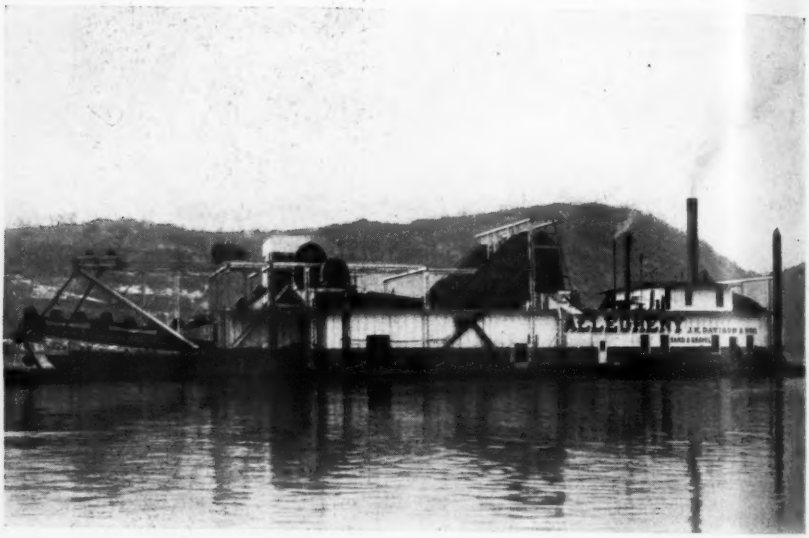
From the sputtering stream of molten metal to the finished PLYMOUTH on the rails, there is pep,—abundant pep.

The Fate-Root-Heath Co., Plymouth, Ohio

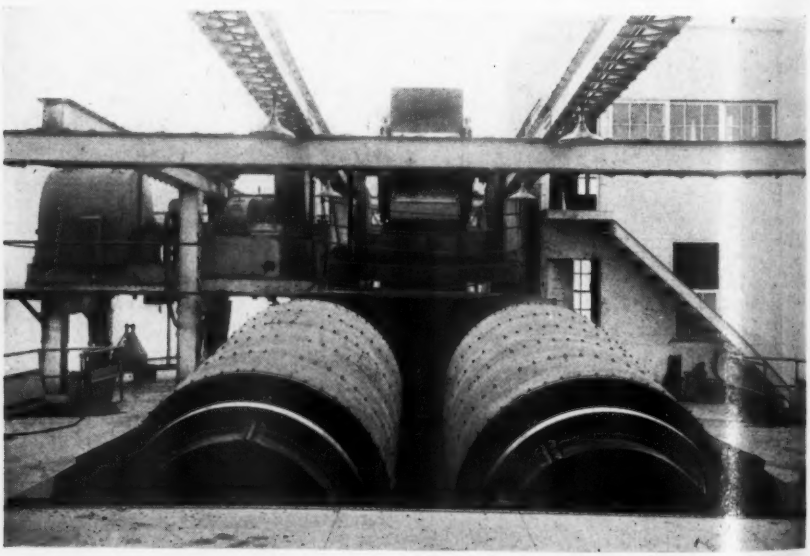
PLYMOUTH

Gasoline Locomotives

Adding to Pittsburgh's Production



Dredge "Allegheny," with Drag Bucket Boom Elevated



The Big Rotary Screens. Buckets discharge at center Background, Operator's House in Right Background

New Bucket Dredge "Allegheny"

DREDGING in the Pittsburgh district is an operation that differs considerably from dredging as carried on in other sections. On the Ohio, Monongahela and Allegheny rivers the excavation of gravel demands the use of expensive floating equipment and the constant attention of experienced operators. Throughout the district the big difficulty that the producers encounter is that of securing sufficient sand to meet the demand of the market. There is gravel aplenty, so much of it that to secure the desired amounts of sand, gravel is excavated and spouted back into the river after the sand which was brought up with it has been carefully separated. A strange condition, this would seem, to many producers in other sections of the country, notably the middlewest, where, to secure sufficient gravel, it is necessary to excavate much more sand than is needed and let the unused material pile up or chute it back into the pond or river.

The latest development in the dredges of the Pittsburgh district, that were designed to cope with these conditions, is the fine, new all-steel electric dredge "Allegheny" of the J. K. Davidson & Bro. Sand Company. This concern has been operating for some time around Pittsburgh, using craft similar to the "Allegheny," but not nearly her equal in design, equipment and efficiency. This splendid dredge is under the command of Capt. Charles H. Smith, a licensed river pilot of long experience. It is said to have cost $350,000.

The design and construction of the dredge was carried out under the supervision of Capt. Smith and Mr. Joseph Breslove, a consulting engineer with offices in the Oliver Building, Pittsburgh, Pa.

The "Allegheny" marks an epoch for this class of equipment in many ways. In addition to being the largest drag bucket line type dredge in commercial service on river excavation, the buckets not being exceeded in size by even the large gold dredges of the Pacific coast, it boasts of a caterpillar type of bucket action in place of the usual stiff frame type. Apart from its extraordinary size and capacity, which is approximately 18,000 tons of sand and gravel per 12 hours run, it has the distinction of having all of its machinery electrically driven from its own self contained power plant. This power plant is a complete high pressure condensing steam turbine installation, worthy of being compared with similar sized stationary layouts.

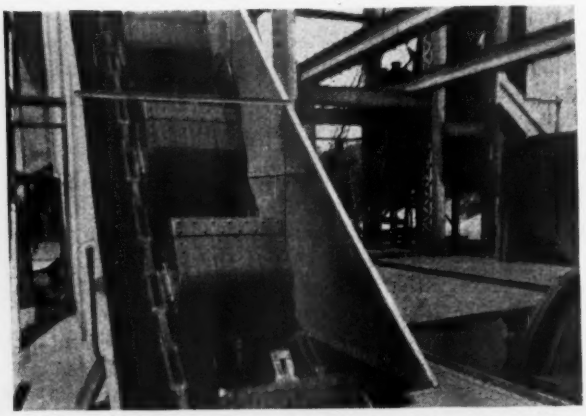
The boiler room contains 2 Heine cross drum marine water tube boilers of 308 horsepower with semi-automatic stokers. The boilers are all steel encased, reducing radiation to a minimum. Ash is discharged into a hopper under the boilers from where it is sluiced out through openings in the bottom of the hull. The boilers operate at 150 pounds pressure. Draft is furnished by a variable speed motor driven induced draft fan located in the base of the short steel stack which is supported on the steel breeching over the boilers. This eliminated the high stack which would otherwise be required for such large boilers, and in addition provides a variable draft to suit the boiler load. The boiler room also contains a steam driven boiler feed pump, steam driven supply pump and a Cochrane open feed water heater. All exhaust steam from the auxiliaries discharge into the heater resulting in an average feed water temperature of over 200° Fahrenheit

Adjacent to the boiler room is the turbine room. This contains a 500 kilowatt Kerr steam turbine geared to 500 kilowatt General Electric 250 volt direct current generator through a

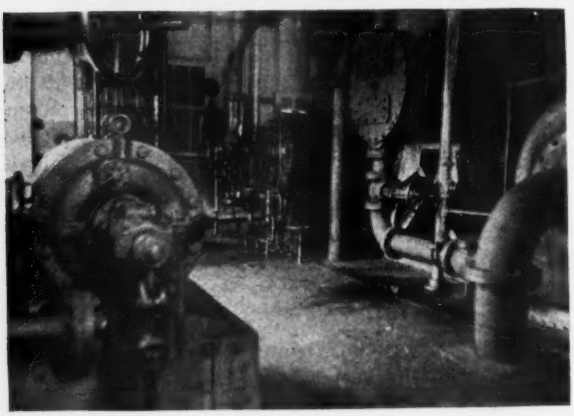
high speed reduction gear. This unit is installed on a special reinforced concrete mat tied into the deck beams and bulk heads; resulting in operation singularly free from vibration. The turbine exhausts upward through a special exhaust connection and horizontal exhaust line into a Worthington surface condenser served by a marine, beam type vacuum pump. The condensate is pumped back into the open heater. Circulating water is taken from the river, pumped through the condenser tubes by a centrifugal pump and returned to the river. It is passed through a settling basin before going to the condenser so as to clear it of sand and foreign matter.

The oiling system of the turbine is self contained and the oil circulates continuously throughout the machine. A Richardson-Phoenix oil filtration system located below the deck automatically filters the oil in the system and keeps it in first class condition.

A small 25 KW generating unit consisting of a direct coupled non-condensing steam turbine and 250 volt generator is used for lighting and repair work when the large unit is not in operation. In addition to supplying the lighting it is used occasionally for the operation of capstan, barge and anchor hoist when the large unit is shut down. At one side of the turbine room floor is located a General Electric 6 panel switchboard consisting of two generator panels and four panels with the necessary instruments, switches and circuit breakers. This is used only for handling the generating units and the main feeders, all the machinery being operated separately from an auxiliary control switchboard located in the operating room in another part of the boat. All cables and wiring passing between this control board, the main switchboard and generating room is carried in conduit and water tight fittings.



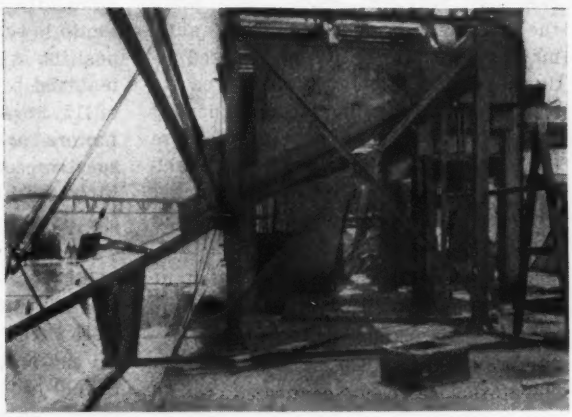
Secondary Buckets Elevating Sand from Rotary Screens



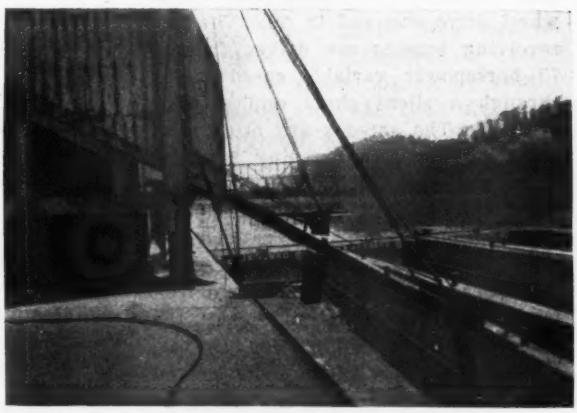
A Corner of the Power Plant, Dynamo Turbine in Center

For the greatest economy and convenience of operation variable speed is desirable for practically all machinery in use on the dredge and consequently it was decided to adopt direct

current at 250 volts. All operations pertaining to digging, screening and washing material are controlled from a pulpit housed in the forward part of the dredge and at a height which permits the operator to overlook the main bucket line, boom hoist, screen and the auxiliary sand and gravel elevators. In this control room is installed a complete distribution switchboard with all necessary instruments, switches and circuit breakers. The main digger motor and boom hoist motor are each controlled from separate panels. Separate meters indicate the power taken by each individual machine and recording meters the total for any given period. An Esterline curve drawing wattmeter on the switchboard is placed so as to be visible to the operator in the pulpit and records the power taken by the bucket line at all times. The operator thus has before him the power taken by the bucket line, the rising buckets coming up to be dumped and the submergence of the boom, from which he is able to determine at all times the nature of the digging. The chart produced by this wattmeter is also a graphical record of the operation of the dredge with respect to time and may be used as a permanent record of the digging operation. The large motor switches are not handled direct but through master switches in the pulpit. The magnetically operated switching gear and relays are located in a separate room below the operating cabin and the operator is, therefore, only required to handle the master switches which are conveniently within reach, easy to handle and permit variations of speed or reversal of direction with a minimum loss of time and effort. The lower room is kept locked and is only accessible to the electrician thus minimizing danger from accidents and interference. Special control equipment furnished with the digger motor is so arranged that in the event of the bucket line becoming tangled or if



Hum-mer Screen for Selecting Finer Grades of Gravel



Barges Are Loaded at Side. Spout Adjustable for Near and Far Loading

excessive "caving" should take place the full motor field would be automatically restored, the motor speed reduced and sufficient time given to clear the obstruction without opening the main circuit breaker. This feature has been unusually successful, enabling the operator to follow the bucket line operation so closely that the load can be kept almost uniformly constant.

The boom hoist motor is rated at 110 H.P. and is operated by a 6 point master switch and arranged for dynamic breaking. The sand and gravel elevators are each connected to 50 horsepower, 400 to 800 r.p.m. motors and geared to their respective elevators through a cut worm and worm wheel drive enclosed in oil. The two revolving screens are driven from a 75 horsepower variable speed motor through a silent chain and suitable gearing. The screens are fitted with roller bearings, there being no belts in the entire installation. In the hold are 2 De La Valle centrifugal pumps with an output of 3,000 gallons per minute each, for supplying wash water to the screens. These pumps are driven by variable speed motors to suit the amount of water required for any particular material. As they are located below the water line these pumps do not require priming. The controls for the pump motors are installed in the pulpit and can be handled without leaving the digging platform. The hoists were furnished by the Lidgerwood Mfg. Co. and all hoist motors are Westinghouse enclosed mill type, particularly adapted for this purpose. The hoist controls and switches are installed in steel encased stations throughout the boat where they are accessible to the men handling the material. Three of the capstans are electrically operated with 7½ horsepower motors and one of the capstans with a steam hoist. The anchor hoists, which are 24x24 inches, 60 feet long, are operated through 4 motors of 15 horsepower and are dynamically braked, enabling the operator to lower the anchors to any desired position with safety and dispatch. The material barges are moved by 2 motors of 15 horsepower each. All of these motors are operated from their respective control stations, so located as to be within easy reach and sight of the operator.

All electric wiring throughout the dredge is enclosed in conduit and weather tight fittings. Particular pains were taken in the design of the electrical equipment so as to make it as nearly fool proof as possible. It is a model of convenience and a number of difficult problems in control were worked out to suit these particular conditions. By electric drive the loads on the individual machines form a fairly uniform total with a resulting high economy of power generation. Inasmuch as the usual dredge operator is not electrically versed the system of remote control as adopted greatly simplifies the handling and permits him to devote his entire energy to the work of digging and handling material. The layout of the power station and steam piping was also given considerable thought. The operation of the dredge so far has shown that the designs as developed to suit these particular commercial requirements will be very economical of labor and that the overall fuel consumption per ton of finished material will be extremely low.

Most of the machinery used throughout the boat was especially designed. An idea of the size of the undertaking may be gained from the facts that 93 tons of manganese castings were used in the construction and that the electrical work required a full carload of wire, costing about $23,000.

The sight of the big continuously operating dredging buckets elevating and discharging their contents of 21 cubic feet each is quite impressive. There are 33 of these buckets and, powered

by a 250 horsepower motor with speed varying from 400 to 750 r.p.m., they discharge at the rate of 12 to 24 per minute. Speed reductions are obtained, as in all other places throughout the boat, by speed reducers manufactured by the McIntosh-Hemphill Company of Pittsburgh. They were built with Tisco manganese steel lips and chains furnished by the Taylor-Wharton Iron and Steel Company, and manufactured by the Goodman Engine and Machine Company of Pittsburgh, who also built the screens and secondary buckets.

Provision has been made on the gravel side of the dredge to secure pea gravel by the installation of a Hummer screen manufactured by the W. S. Tyler Company of Cleveland, Ohio.

The steel cable used throughout was furnished by the A. Leschen & Sons Rope Co., of St. Louis, Mo.

J. K. Davison & Bro. have a fleet of 24 steel barges, 135 feet long with 26 foot beams, arranged with 4 watertight bulkheads with bitge pumps built in. They are brought to and from the dredge by the S. S. Bronx and other tugs owned by the company.

The Independent River Sand Company has been organized at Moundsville, West Virginia, with a capital of $250,000. Ernest Frey, Stephen Steranchak, J. R. Dorsey and R. E. Heck of Pittsburgh; and H. L. Allshouse, Irwin, Pa.

Construction has been begun on the new plant of the Green Bay Sand and Gravel Company at Green Bay, Wis. incorporated with a capital of $50,000.

The Acme Cement and Plaster Co., with plants over the northern and western portion of the United States, has completed the taking of options on one thousand acres of gypsum rights north of Centerville, Iowa, and will sink a big shaft 10 by 20 feet and in due time construct a mill of 300 tons per day capacity. The only detail that remains to be disposed of before the construction contracts are let is for the railroads to establish their freight rates satisfactory to the company.

Pumping Water With an Injector

THE writer was once employed at a quarry where the head of one of the crusheres became heated; and no matter how the lubricating was done, the head still became heated, so it was decided to keep it cool with water.

To accomplish this a small hogshead was set up over the crusher with a small faucet in it and the water was thus allowed to run slowly onto the head and thus keep it from overheat.

The biggest problem was how to keep the hogshead filled with water. The only water supply was used for the boilers and came from a nearby spring; the water flowing by gravity to a barrel and was then picked up by an injector, and put in the boilers.

It was suggested that a small pump be purchased and put at the spring and the water thus pumped to the hogshead. This meant the expenditure of money for the pump, and worse still, the attention of the pump to keep it going and stop it when the hogshead was full.

The writer deemed this too expensive and instead placed a globe valve between one of the injectors and the boiler it fed. He connected this with a pipe leading to the hogshead, with a globe valve in this line near the injector.

Thus when the injector was not needed for the boilers, the valve to the hogshead was opened and the one on the line to the boiler was closed, and the hogshead was kept supplied with water. The water dripping on the crusher head kept it cool.

By this means a pump was saved and the entire outfit was rigged up for a few dollars. For a small supply of water at not too great a height an injector can be used as a pump, as was done in this case.

National Lime Convention Emphasizes Technical Advance

IT GOES without saying that when as many as 100 lime producers get together in one place, under almost any set of circumstances, something new on lime is going to develop. For a lime producer is a man who does a little more than dig and burn stone. He is a man who is keenly alive to the fact that his is one of the most important activities in the industrial and agricultural fields. He knows a lot about his product, and he also knows there is a lot he still has to know about it. He is asked to produce many kinds of material to fill many needs and he has to do his work under conditions that vary greatly in the different sections of the country. So when he meets another lime man there are a good many questions to ask, and a good many bits of information to impart, and he always departs from the conference with a greater knowledge of, and more enthusiasm for that wonderful material—lime.

This is about what happened at Cleveland, during the Convention of the National Lime Association on June 14th, 15th and 16th. Over 100 leading producers of the country met to discuss their problems and to learn more about the material with which they work. They listened to a very carefully arranged program, one that gave each individual producer an opportunity to look at his own particular plant and his own particular methods in a new light, as well as to get a glimpse of the broadening field in which he labors. This Convention, the fourth such annual event of the National Lime Association, was the most successful that has been held.

All of the sessions were characterized by the absence of a lot of the general and indefinite discussion that fill the programs of so many association conventions. Here the one topic that was before the producers at all times was lime, lime from a good many view points, but always lime. They considered lime technically, scientifically, economically, industrially and commercially. They considered it always as practical men who also know their subject well from other angles.

The first number on the program was the reading by Nathan C. Rockwood, of a paper on the Rockland and Rockport Corporation's lime plant, described in PIT AND QUARRY of June, 1921. With Mr. Rockwood's paper was shown a number of lantern slides covering various operations at the plant.

Mr. Irving Warner, plant manager of the Charles Warner Company, Wilmington, Del., was on the program for a paper on "Lime Burning in Rotary Kilns." To save time, however, and enable the Convention to keep up with its program, Mr. Warner gave instead an extemporaneous address speaking briefly on some of the more interesting features of rotary kiln burning practice. Following Mr. Warner's remarks, the subject of rotary kilns was discussed in general by the membership.

A paper on the use of lime in sulphide paper pulp was received with great interest. The paper was prepared and delivered by Mr. P. A. Paulson, a consulting engineer of Appleton, Wisconsin, a section of the country in which paper manufacturers are quite active. Mr. Paulson's dealing with the subject was that of a man who knows whereof he speaks. The paper, which covered the subject thoroughly, gave lime men a new idea of the way in which their product fitted into the sulphide paper industry. He showed

them what qualities in lime were particularly demanded. Mr. Paulson told them how a dolomitic lime of high magnesium content makes for a more desirable material from the paper pulp standpoint than a high calcium lime. Magnesium bisulphate is more stable and produces a more general liberation of sulphur dioxide in the cooking processes. This results in a much more uniform pulp which is considerably easier to bleach and is softer, whiter and more pliable than that resulting from pure calcium bisulphate. In a recent investigation it was found that a number of mills using the straight calcium lime were making as high as 8 per cent of screenings as compared with the 2 or 3 per cent screenings made where high magnesium lime was used. Lime to be satisfactory to the sulphide paper manufacturer should also be free from iron and other metallic impurities. It should also be well burned. Air slaked lime should not be used, as the moisture is likely to vary and a uniform proportion of base in the acid would be difficult to maintain.

Mr. R. R. Shively, of the Monongah Glass Company, a consultant glass chemist and a Fellow of Mellon Institute, made a better case for the producers of high calcium limes than Mr. Paulson. He told of how limestone, high calcium lime, and high magnesium lime, all found a place in the glass industry, their use varying with the product desired and the individual preference of the user. Some manufacturers will not use a lime that contains as high as 3 per cent of magnesium while other producers, to accomplish an equivalent result, would prefer dolomitic lime containing as high as 35 to 40 per cent magnesium. Limestone, Mr. Shively stated, undoubtedly costs less, is of constant composition and less objectionable to handle. On the other hand, limestone batches cannot be melted without the use of much more heat than is required to melt batches of quick lime and hydrated lime, practical experience verifying this fact, which from a thermochemical standpoint would be expected. Many producers prefer a quicklime because it is easy to melt and contains practically no organic matter. Its less agreeable features are that it is unstable, more expensive, and unpleasant to handle. Hydrated lime is harder to melt than quick lime and is, of course, more expensive.

Mr. Shively drew attention to the fact that the increasing use of machinery in the glass industries is constantly demanding the use of more uniform grades of lime. A few years ago most of the glass produced was blown by individual workmen, and variations in the materials used could be compensated for more easily when individual control over each batch going through was more exact. But, now that machinery is being used more and more, the glass that goes through that machinery must be more constant in all its characteristics. This means that the lime utilized in the process cannot deviate greatly from certain set requirements and imposes upon the lime producer the necessity of exercising great care in the production of his material.

The presence of metallic impurities in the lime has a great influence on the finished glass product. Where window glass is made—coarse limestone is, as a rule, preferred, and there the iron content may run as high as 0.8 per cent, while with tableware and all whiter glass in general must be made from material using fine ground lime in which the iron content does not exceed 0.2 per cent. The color of glass is determined largely by the presence of various metals in the lime. Ninety

per cent of the glass manufacturers' troubles, Mr. Shively said, are traceable directly to the lime that is used in the process. Mr. Shively recommended the adoption of certain of his own specifications, which vary but little from those published in Bulletin No. 188 of the Bureau of Standards. These specifications he said would let the lime manufacturer know what is expected of him and assure to the glass manufacturer the limes required.

At the conclusion of Mr. Shively's talk, a number of producers asked questions that gave him opportunity to touch upon a few points that his paper did not cover. One gentleman asked him about the relative merits of limestone, quick lime and hydrated lime as affecting the strength of the glass and its other mechanical properties, stating that he understood that while there were many desirable features to the use of limestone in glass manufacture, it resulted in a weaker and more brittle product than was secured from the use of lime whether slaked or unslaked.

"Soda and Sulphate Paper Pulp Industry," a paper prepared by Mr. G. K. Spence, chief chemist of the New York and Pennsylvania Paper Company at Johnsonburg, Pa., covered briefly though accurately the use of lime in the industry with which he is associated.

Quick lime is used in converting sodium carbonate into caustic acid and sodium sulphate into sodium sulphide. Mr. Spence explained these two processes and the particular place that they fill in paper manufacture. His recommendations should go a long way toward helping lime producers to make proper material for paper manufacture, incidentally increasing their own sales.

In the years past the pulp manufacturers were in the habit of buying from the producer lime that came up to certain general specifications, receiving this material in bulk and car load lots, and making the best of it in the process. Of late this condition has been changed considerably. The principal and most desirable feature in caustic lime for pulp-making purposes is a high content of active calcium oxide. The pulp manufacturers in many cases make a practice of carefully testing each car of material for active CaO content before its use. When the car of lime does not come up to the content guaranteed by the lime manufacturer, the material is either rejected outright, or employed in the pulp making process after the parties affected have had an understanding that claim will be allowed for the difference in CaO content and also for the loss of soda on account of excessive amounts of sludge discharged from the pan. The presence of impurities usually found with lime do not give much trouble to pulp manufacturers. In the causticizing processes iron, aluminum and magnesium oxides, calcium sulphate and calcium carbonate exert no influence whatever, but are present merely as so much ballast. An excessive amount of silica, however, especially with overburned lime, very much reduces the active CaO content of the lime because of the fusion of the silicates, which encloses some of the CaO and prevents the slaking water from reaching it. Lime for causticizing purposes should contain about 90 per cent active calcium oxide and not over 1.25 per cent magnesium oxide or 1.5 per cent silica when received at the mill.

Mr. Spencer told the lime producers that they could be of great assistance to the paper pulp industry if they would make it a point to work in harmony with the pulp manufacturers. For example, in the matter of burning a lime of silicious content a little higher than usual, great care should be taken that the material is not over burned. To achieve the most desirable results in accomplishing this the lime producer should work in close cooperation with the pulp maker. As a result

On the Evening of the Second Day We All Went Out to the "Black Whale Inn"

—We Spent a Little Time Taking in the Fine View of Lake Erie

—Then We Staged a Few Tug-of-War Contests.

—Little Groups of Friends Talked It Over

—Our Nestor Was With Us

—And Our "Fidus Achates"

—Quite a Few New Acquaintances Were Made

—The Nickel Pitching Contest Had An Interested Audience

—Even Secretaries Find Time and Inclination to Smile Occasionally

—And the Management of a Chemical Department Still Leaves a Little Time for Recreation

—Texas, Tennessee and Alabama Were Well Represented

A Few Members of "The Old Guard"

of the requests from the manufacturers, some lime men today are grinding burned lime and furnishing it to the pulp manufacturers in granular form, producing a desirable material for the industry that requires it, incidentally broadening their own lines.

For much of the good work that has been done in the last few years in keeping various producers working harmoniously with the technical representatives of the various industries using lime, Mr. Spence congratulated the National Lime Association on its capable, energetic research department.

The program at this point called for a reading of a paper on water softening by Mr. S. C. Hadden, editor of Municipal and County Engineering. Mr. Hadden was unable to be present at the Convention, but sent a carefully prepared paper on the subject which was read at another time during the Convention by Dr. Fink of the National Lime Association. Mr. Hadden's paper showed that the attitude towards centralized water softening plants was continuously becoming more favorable and that municipal engineers are rapidly being converted to the idea. Centralized water softening plants offer a large market for lime producers. Consumption of materials is large and of a character undoubtedly that would

not require the close attention to rigid specifications as in the other chemical uses of lime.

It is well to observe in passing that centralized water softening plants are showing up well wherever they are installed. At McKeesport, Pa., the river water, polluted with mine drainage and of constantly fluctuating hardness, is made soft and safe to drink by being passed through a centralized water softening plant which employs soda ash and lime, followed later by mechanical filtration.

Mr. Hadden urged the members of the National Lime Association to inaugurate a vigorous campaign for the installation of centralized water softening plants in all cities where the quality of the water could be improved by processing.

An interesting feature of the first day's program was the paper read by Miss Mary E. Squire, president and general manager of the Allwood Lime Co., at Manitowoc, Wis. Miss Squire, who is associated in the management and ownership of the Allwood Quarry with four other women associates attended the Convention in the company of (Miss) Dr. J. D. Carpenter, one of the directors of the Company. Miss Squire prefaced her account of the Allwood quarry by telling the producers attending the Convention that she had come to the Convention "to ask a thousand whys." The character of the questions illustrates well Miss Squires' extensive and intensive knowledge of lime. The questions were those which a producer who is really alive to the possibilities of the lime industry would ask himself.

At Miss Squire's plant, with a capacity of 50 tons a day, there is being produced a quality of lime similar to that which had to be imported from Germany and for which the price was from $80.00 to $200.00 per ton, laid down on the dock at Hoboken. Miss Squire, unable to believe that this particular lime could not be produced in her own plant, made 240 tests extending over the better part of four years, to prove to herself that it could be done. That lime is now being produced at the Allwood Quarry and is being used for finishing steel ball bearings, surgical instruments, and other material and equipment that must be highly polished and accurately sized.

"Lime as Used in the Textile Industries" was discussed in a paper read by Dr. Elton R. Darling, specialist and professor of chemistry at James Milliken University at Decatur, Ill. Dr. Darling's paper was very carefully written and lime producers could learn from it a lot about their products as applied to this industry.

Lime is used in the textile industries for two purposes. The most important of these and the one requiring the greater amount of lime is that which includes the lime boil, the recausticizing of waste caustic liquors and the softening of water for dyeing. The second calls for the use of small amounts of lime for such purposes as liming keirs, dyeing, and the scouring of wool. Opinions on the specifications of lime for the textile industries vary largely with the individual preference of the manufacturer, influenced by the old traditions of the industry, by the lack of technical knowledge, and by the active propaganda of large alkali manufacturers. Dr. Darling says: "After much experience with lime, I consider the product that is uniform in color, not lumpy, very active chemically, with a calcium oxide of at least 90 per cent, with less than 2.5 per cent of magnesium, 3 per cent of silica, 2 per cent of iron and aluminum oxides, well suited for lime boils." Lime used in dyeing should contain less than 1 per cent of iron oxide. It is better to employ hydrated lime for this purpose, and the same is also true of the scouring operation.

Besides being cheaper and safer to

handle, lime has many advantages in the textile industries over the strong alkalies. It reduces the number of uneven boils to a minimum, gives the cloth a better bottom, makes possible complete removal of the wax from the cloth, permits the handling of the operation in half the time required by caustic soda, when the pressure keir is used. It is very efficient in removing proteid matter and its action is very mild as compared with the stronger and harsher action of the strong alkalies.

Dr. Darling's recommendation to the National Lime Association was that the association undertake the study of possibilities of the use of lime by putting men into textile plants to develop data on actual working conditions. This research work in connection with the work of a laboratory nature will clear up many of the problems involved in the lime boil, dyeing and other textile operations.

Mr. H. D. Pratt, of the Link-Belt Co., Philadelphia, Pa., appeared before the Convention to show a number of ways in which Link-Belt equipment was utilized to make for greater efficiency in and around lime plants. Mr. Pratt's talk was illustrated by quite a number of slides showing either photographic views or line drawings of Link-Belt equipment in use. After discussing all this equipment he proposed to members of the Association a new plan for drawing kilns which he distinctly stated was merely an idea whose worth had not been tried out. His proposal was to draw the kilns by a skip, mounted on a tractor, which runs under the kilns and takes on a load which it would then distribute over the cooling floor. The idea was so novel that none of the members present were prepared to make any comment on it, but the Link-Belt Company will undoubtedly hear of the idea again after a number of producers have thought it over.

"A New Idea in Lime Barrels" was offered to the Convention by Mr. James H. McNamara of the Eagle Rock Lime Co., Eagle Rock, Va. Mr. McNamara's idea, which he offered free to any producer present, made a distinct hit. The lime industry will undoubtedly see more of Mr. McNamara's new barrel.

Dr. Oliver Bowles, engineer of the United States Bureau of Mines, laid before the Convention an account of what the Bureau of Mines has accomplished for quarry operators. Mr. Bowles has visited hundreds of quarries, observed the equipment and processes employed, the character of the mineral formations, and anything in the way of innovations that the various producers might have installed. It is his intention within the next year to visit many more workings and, at the termination of these activities, to publish a report which should be of benefit to all quarrymen, since it will contain an account of the best operating methods employed at the various points. Already the Bureau has been of great assistance to operators. Whenever Mr. Bowles encounters a condition that he has met before he has given the producer the benefit of the other man's experience and, in most cases, has greatly helped. Mr. Bowles requested that during the next year all quarry operators whose works are visited would cooperate with the Bureau freely, giving all information that is asked for, and thus contribute to the advancement of the entire industry.

A feature of the program of the first day was an address by Hon. Newton D. Baker, former secretary of War. Mr. Baker, whose forensic ability is well known, delivered a talk that gave a bit of entertainment and contained a number of good business ideas. He touched upon the activities of trade associations, defining the character and extent of these activities as set forth

recently by the proper Government officials.

Mr. Warren E. Emley, engineer in charge of all investigation of the United States Bureau of standards, touched upon a very interesting subject, the effect of lime in concrete. Mr. Emley illustrated his talk by graphs projected by a stereopticon machine. He showed why the mixture of lime under certain conditions greatly increased the strength of concrete, how under other conditions the workability of concrete varied inversely with strength when lime was added, and how with all conditions properly arranged, the workability of concrete wthout loss of strength could be accomplished. Mr. Emley made reference to exhaustive experiments that had been made to establish these facts at the United States Bureau of Standards. Prof. H. G. Berry, professor of structural materials at the University of Pennsylvania, supplemented Mr. Emley's remarks by relating experiences on the use of lime in concrete at the University of Pennsylvania.

At the complimentary luncheon Thursday, Mr. H. Elmo Martin of Cleveland, told "How to Handle the Day's Work." Mr. Martin's dynamic address took well with all present. He held up to ridicule a few of the practices that all business men allow to creep into their daily routine and which result in a serious impairment of efficiency. He then gave a few interesting and valuable hints that should help an executive to handle himself and to handle others.

On the evening of the second day, the entire Convention attendance was transported by motor to the Black Whale Inn, some 20 miles to the west of Cleveland along Lake Erie. Here a fine supper and entertainment, provided by the Valve Bag Company of America and the Ohio members of the Association was enjoyed.

The third day of the Convention opened with a paper read by Dr. M. E. Holmes, manager of the Chemical Department of the National Lime Association, on "Bearing of the Work of the Chemical Department on the Larger Use of Lime in the Chemical Field." Dr. Holmes' talk began with reference to the great demand in the chemical industries for a material that functions like lime, touched upon the intrinsic utility of lime and the necessity for disseminating a general knowledge of the utility and the use of lime. He stated that the dissemination of this knowledge comprises two distinct activities—first, getting the necessary information, and second, disseminating this information. In other words there must be research and investigational work in the first place and publicity work in the second. Dr. Holmes then talked about the activities of the Chemical Department in experimenting with various lime samples. He told of how samples from most of the members of the Association had been studied. Most of the research and investigational work has been done in the Association's central office. There are other activities along these lines at Ohio and Indiana State Universities. Ohio State University has four men under Professor Withrow, burning various typical limestones under various typical conditions of time and temperature. From this it is expected that there will be secured valuable data on the way in which the properties of lime for chemical uses can be altered by varying the burning conditions. Professor Mathers at the University of Indiana is working with two assistants on various problems bearing on specific uses of lime as a dehydrating agent, plasticity of lime for mortar, the action between lime and hard water, manufacture of polishing compounds, the rate of slaking and complete hydration of lime, the settling of lime, and whiting substitutes. Much has already been accomplished

The results of these investigations are being brought before the technical and industrial societies by correspondence, lectures, bulletins and publishing of results in technical journals.

Succeeding Dr. Holmes, was Professor F. C. Mathers, professor of inorganic chemistry at the University of Indiana to whom reference was made in Dr. Holmes' talk. Experiments conducted by Prof. Mathers showed that hydrate may be made to settle more rapidly by slaking the quick lime with water that contains from one-half to one per cent of calcium chloride, the cheapest of a number of substances that will produce the same results. Slaking the quick lime with water containing from ½ to 1 per cent sugar solution results in the slowing up of the settling process, while the slowest settling hydrate of all is that of lime slaked with excessive water. Hydrates ground in a pebble mill settled slower than unground hydrates.

Slacking can be made slower or more rapid by the addition of the proper substances. The following solutions as compared with the pure water, gave the slaking results indicated, while equal weights of the liquids in room temperature were used to treat a quick lime made from marble. One per cent of hydrochloric acid, 1/12 as long; 5 per cent hydrochloric acid, 1/35 as long; 1 per cent barium chloride, 1½ times as long; 5 per cent alcohol, 2½ times as long; 1 per cent creasol, 5 times as long; and ½ per cent sugar, 15 times as long.

By heating it to 840 degrees F. hydrated lime may be reburned or changed back to quicklime that is very fine and exceedingly active toward water. It slakes instantly in cold water and there is no apparent action on this active reburned lime by the solutions which retarded the slaking of ordinary quicklime. The reburned lime will instantly combine with the water in 95 per cent alcohol. Starting with a percentage of alcohol of 93.5, original slaked lime will produce a percentage at the end of the first day of 95.96, while the reburned quicklime will produce a percentage of alcohol of 99.44, at the end of the same length of time. Ten days are required with the original commercial quicklime to get an equally strong anhydrous commercial alcohol. These results were arrived at when twice the quantity of lime required for combining with the water and the alcohol was added.

The plasticity of high calcium limes was apparently unaffected by slaking the quick lime with different chemical solutions and then varying temperature conditions; by slaking in water vapor or steam in various temperatures; by partially slaking as above, with the balance of the slaking in the ordinary way; by partial carbonation, followed by slaking in the ordinary way.

Dr. E. R. Weidlein, director of research at Mellon Institute at Pittsburgh, Pa., showed that the most effective means developed so far for the advancement of physical and chemical technology is furnished by scientific methods and that accordingly scientific investigation is an essential economic adjunct to industrial enterprise. Many cases, where enormous sums of money have been saved annually through scientific research were outlined by Dr. Weidlein. He stated that research work is successful only when conducted by a number of related industrial interests working together. He expressed himself as in favor of free interchange of information, and of cooperative research and investigational work to be conducted by all of the industry. Dr. Weidlein closed his remarks with a compliment to the National Lime Association for the valuable results that accrued to the research work.

"Lime Crop Protection" was the subject of a well written paper by Professor W. C. O'Kane, of New Hamp-

shire College. He began with reference to the times when lime was applied to the soil without any scientific knowledge of its preparation and without any true understanding of its actual value and then told of more modern methods of lime application. He pointed out the need for lime when it is deficient, even in many areas where the soil is underlaid with limestone. A great deal of careful and painstaking experiment must be carried on to secure the real facts. Many uses of lime are known to be helpful in agriculture. There are undoubtedly many more to be discovered. Quite recently additional work has been done in an attempt to discover just what are the possibilities of lime in the way of controlling certain plant diseases, but the subject has not yet been followed up as it should have been. A combination of lime and sulphur as one means of controlling plant pests was first made in about 1833. Since then some real work has been done along these lines. Lime has been effective in preventing root rot of corn, and club root of cabbage; in protecting melons and cucumbers from the striped cucumber beetle and in minimizing or doing away with many other plant diseases.

Mr. O. B. Towne, secretary of the Waxed Paper Manufacturers Association, gave members attending some real new ideas on the subject of trade associations.

Mr. J. A. Slipher, manager of the Agricultural Department of the National Lime Association, presented a paper that gave "Some New Angles On the Use of Lime in Agriculture."

At the complimentary luncheon on the last day of the Convention, Mr. Geo. A. Coulton, vice-president of the Union Trust Company of Cleveland, read a very fine paper on business conditions in the present and the near future. After making a careful analysis of recent tendencies in the business world, Mr. Coulton believes that the future, if faced with cheerfulness and optimism, is filled with good things and that the prosperity that has been in hiding so long is at last ready to put in an appearance.

At the close of the Convention the election of officers for the ensuing year resulted in no great changes. All the officers with the exception of the treasurer were re-elected. Mr. Chas. Warner, president of the Charles Warner Company and of the American Lime & Stone Co., was retained as president, for the ensuing year. Mr. Geo. J. Nicholson, president of the White Marble Lime Company of Manistique, Michigan, was also retained as vice-president. Mr. W. R. Phillips, continues in his recently accepted position as secretary-manager of the Association. Mr. Milton McDermott of the Knoxville Sand & Gravel Co., was elected treasurer. His is the only new name appearing on the list of officers.

The governments of the numerous states in which mining constitutes an important industry are notably increasing their efforts each year toward promoting the safety of miners, according to the U. S. Bureau of Mines. Accidents underground are being made less frequent and mines are made safer by means of revising and adding to the state mining laws, by enforcing them through mine inspection departments, and by hearty cooperation with other agencies working toward greater safety for miners. Vigorous efforts along mine-safety lines have been made particularly by the State of Oklahoma. A statement issued by Mr. William Ogilvie, mine inspector of district No. 2 in that State, emphasizing the value of the types of electric cap lamps approved by the Bureau of Mines as "permissible" for use in gaseous mines, is reproduced in Serial 2366, which may be obtained from the Bureau of Mines, Washington, D. C.

Frank S. Altman, field engineer of the Portland Cement Co., Topeka, Kans., has been appointed district engineer for the company in charge of Minnesota and North and South Dakota, with offices in Minneapolis.

Best Highway System

Proposed State Construction Being Mapped at Washington

By Our Washington Correspondent

A system of highways that will serve the whole country and will be far superior to any other in the world is being mapped out by Federal and State engineers, reports to the Bureau of Public Roads show. It is estimated that the system will comprise 180,000 miles of road. The Federal highway act recently enacted specifically requires that all Federal aid be spent on a connected system of highways consisting of not more than 7 per cent of the road mileage in each State, and that this system shall consist of interstate or primary roads and intercounty or secondary roads. Proposed systems have been received by the bureau from all but eight states. They are plotted on a large map of the United States and carefully examined as to coordination with the roads of adjacent states and service to all sections of the country. Where coordination is not satisfactory conferences are held with all interested State highway officials and routes adjusted. Many States have already adjusted difficult problems with their neighbors. As an example the system sent in by Nebraska showed a big gap in an important road along the northern boundary. It was learned, however, that South Dakota would follow with a system that would fit like pictures on toy blocks. Since the Federal highway act of last November became a law, only roads certain to be on the system have been approved for construction.

The $350,000,000 appropriated by Congress as Federal aid will result in the construction of about 46,000 miles or road, says the bureau. This mileage would parallel the railroad from New York to San Francisco nearly 15 times, or, if divided equally among the States would give nearly 1,000 miles to each state, and from reports made to the bureau the States are exerting every effort to make the present season a big one for road construction. The time required for the completion of the system will depend upon the rate at which the necessary Federal funds are provided.

A considerable lower level of prices for the various items entering into highway construction is reported by the bureau. This conclusion is based on prices by successful bidders on Federal-aid roads and are averaged for the whole of the United States. Some of the figures cover a large volume of work well distributed over the country, while others are based either on small volumes or scattering reports.

In connection with the cost of road building, the Department of Agriculture has made numerous tests regarding the value of materials and the best methods of construction. An experiment to determine just how hard rock or gravel must be in order to be satisfactory for use in building concrete roads is being carried on now. About 60 sections of experimental road are being constructed, in which practically every variety of stone, gravel, and sand will be used. These sections will then be traveled over thousands of times by a machine automatically operated and which has the same effect on the pavement as a motor truck. This will continue until the wearing properties of all the sections are determined. The Department believes that the results of these tests will show that many local materials heretofore deemed unsuitable may be used safely in building concrete roads, thereby saving the cost of importing stone, gravel, or sand from a distance.

While the Department is giving particular attention to the use of local material for road construction wherever possible, a simple, portable apparatus has been devised for testing gravel to determine its suitability for concrete. The device consists of two steel balls arranged so that a piece of gravel can be placed on top of one of the balls and the other ball allowed to fall from different heights and strike the gravel. The heights of fall required to break the gravel is an indication of its suitability to withstand the blows of traffic. Heretofore there has been no satisfactory test of gravel as there has been for stone, with the result that in some instances more costly material has been used when a suitable gravel was available close at hand.

In its search for a means of protecting Portland cement concrete against the action of alkaline waters, the Department announces promising results from treatment with a very fluid crude water-gas tar, such as may be obtained as a by-product from many artificial gas plants. So successful

have the tests been that further investigations of the alkali-resisting properties of tar-treated concrete and mortar are under way and the protective effect of water gas tar on mass concrete structures is being studied. The treatment consists of simply immersing the concrete in the liquid, which is soaked up, even by a dense concrete. Cement drain tile treated in this way and stored from six to eight months in a strong alkali solution have shown no indications of disintegration, and samples tested for tensile strength were as strong as those stored in pure water. On the other hand, untreated samples showed both disintegration and a loss of strength. In certain parts of the country where alkali salts exist concrete drain tile and concrete structures have been attacked. In many such places concrete is a very desirable material on account of the accessibility of the materials that go into it. The Department's investigations aim to devise means of using concrete with assurance.

It has been found that edges of concrete roads curl up and down in response to changes in temperature, and the department has discovered that the curling is caused by the unequal expansion and contraction of the upper and lower sides of the concrete slab under the influence of heat. It has been observed during the middle of the day when the surface of the road becomes hot it expands more than the cooler underside and causes the sides to move downward. At night when the surface is cool the contraction causes the edges to rise slightly. The extreme movement may be as much as one-tenth of an inch. While the warping of the concrete is not in itself detrimental to the road, it may lead to failure of the surface under the wheels of vehicles which travel over it when parts of it are not resting on the ground, the Department points out.

A new policy of announcing additions, removals and changes in the permissible list of explosives has been adopted by the Bureau of Mines, under which lists giving the details of such changes will be issued at short intervals as a Report of Investigations. A list giving such changes, covering the period from March 15 to May 31, 1922, has just been issued as Serial 2362, and may be obtained from the Bureau of Mines, Washington, D. C.

Claude Couldn't Do It

State of Ohio Insists Sandles Sign His Own Name If He Wants To Be Governor

Did you hear the story about how Claude Clark almost got to be candidate for governor of Ohio?

You know who Claude is—the confidential advisor to A. P. Sandles, secretary of the National Crushed Stone Association and the National Agstone Association.

Of course it was really Sandles who wanted to be governor; that's a habit of his. But amid his multitudious duties he left it up to Claude to file his declaration of intention for him.

When the time came to file the declaration, Claude appeared with it, but the clerk whose business it was to receive it, found that it was not signed. But in the meantime Sandles had left for distant parts; and Clark, ever faithful to his principal, went out and signed "A. P. Sandles"—just like that—before a notary.

The latter did not "personally know" either man, as he is expected to do; but took it for granted that the signator was Sandles and let it go at that.

So the declaration was filed, and everything was lovely until some detestable competitor for the nomination discovered that on the day the paper was signed and filed, Sandles was in British Columbia. So complaint was made, and secretary of state, Harvey C. Smith ruled the name off the ballot.

Judge Smith in his opinion, held that "no declaration of candidacy can be received unless signed and verified by the candidate."

"In my opinion these powers cannot be delegated. I would like to find a way to permit the name of A. P. Sandles to appear upon the ballot, but I am unable to do so. The protest is sustained and the name of A. P. Sandles will not appear on the ballot."

But Sandles is young yet. His time will come.

Marion Central Sand Co., Marion, Va. has been organized with a capital of $100,000.

New Dredge for Ohio River

The sand and gravel dredge which is being constructed by the Bucyrus Company of South Milwaukee, Wisconsin, for the Iron City Sand Company of Pittsburgh, Pennsylvania, was launched at the docks of the Midland Barge Company, Midland, Pennsylvania, on June 3, 1922.

This dredge is designed to reclaim sand and gravel from rivers in the vicinity of Pittsburgh. It will dig to an extreme depth of 50 feet below the surface of the water. The material as excavated will be delivered to barges along side as sand and three grades of gravel. The smaller gravel will range in size from 7/32 inch to ⅞ inch. The next classification will be from ⅞ inch to 1¾ inch and the third classification will be from 1¾ inch to 2¾ inch. Any or all of the various sizes of gravel may be saved or rejected as desired. The oversized stones, that is, everything in excess of 2¾ inches will be rejected by the screen and returned to the river. The stones over 8 inches in diameter will be rejected by a set of grizzley bars in the hopper and will not reach the screen.

The digging end of the dredge will consist of an endless chain of close connected 8 cubic foot buckets mounted on a structural steel digging ladder which will have a length of approximately 95 feet and will be suspended concentrically with the upper tumbler and inclined at an angle of 45 degrees for a maximum digging depth. Each bucket will weigh approximately 1,500 pounds, and will consist of a nickel chrome steel casting, forming a link and bowl, and manganese steel lip forming the cutting edge. A round lower tumbler or idler is placed at the extreme lower end of the digging ladder. The upper tumbler, which is hexagonal in shape and designed to form a positive driving sprocket for the buckets, is located about 19 feet above deck. The lower end of the ladder is suspended by two eight-part tackle blocks from a structural overhead gantry mounted near the bow. The complete weight of the ladder with its chain of buckets and tumbler is approximately 225,000 lbs.

The material as excavated by the buckets will be delivered through a hopper into a revolving screen, which will be 7 feet in diameter by 32 feet long over all. The sand screen is about 8 feet 6 inches in diameter by 16 feet long and surrounds the revolving screen at its upper end. The screen is mounted on three rollers. The two upper ones are idlers and the lower one, which is located on the longitudinal axis of the screen and immediately below it, is the driver.

The sand and various grades of gravel, which is being saved, will be conducted by chutes to sumps in either side of the hull immediately abreast of the revolving screen, the sand going to one side and the gravel to the opposite side. From these sumps it will be carried by secondary elevators to a height sufficient to discharge by gravity into the scows alongside.

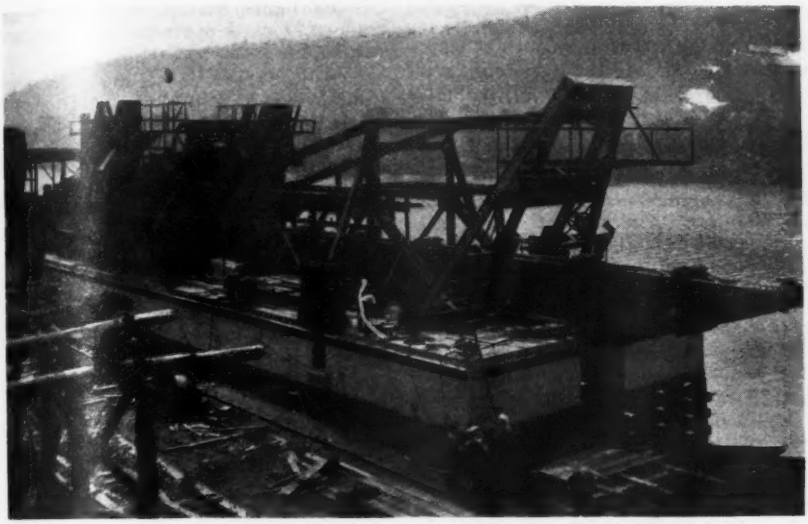
A high pressure pump is installed to break up and wash the material which is delivered to a screen, and to play upon the sand wire in order to keep it cleared, and provide for effective screening. Water for washing the material in this screen is introduced through a pipe which runs from the upper end to the lower end through the screen and is fitted with adjustable nozzles.

Power for operating the dredge is supplied by a 300-h.p. Diesel type, four-cylinder, two-cycle, solid injection oil engine manufactured by the Worthington Pump and Machinery Corporation. This engine operates at a speed of 277 revolutions per minute and is direct connected to a 270 K.V.A. Westinghouse three-phase, 60-cycle, 440-volt generator.

The bucket line is driven from a 125 h.p. motor which is also used for raising the spuds and hoisting the ladder. This motor is direct geared to a five drum winch located on the port side of the dredge forward of the tumbler center line. A brake is provided on this winch which functions to automatically hold the ladder in any position and to lower it only by power from the main motor. The ladder may be raised or lowered while the bucket line is being driven without reversing the main motor.

The revolving screen is driven through a series of gear reductions and a friction drive roller from a 50 h.p. motor.

The secondary elevators are driven through suitable gear reductions from 15 h.p. motors which are mounted overhead near the elevators tumblers.



The dredge is held to its work by four, steel armored wood spuds which are about 65 feet long and mounted in casings at either side of the dredge near the bow and stern.

Four electrically driven capstans are provided for manoeuvering the scows. Each capstan is driven from a 20 h.p. motor.

A 100 h.p. vertical boiler is provided for purnishing steam for syphoning the barges and to heat the dredge in cold weather. The boiler is designed for burning the same oil which is used by the Diesel engine.

The principal movements of the dredge will be controlled by a single operator located in an overhead pilot house or lever room, so that he can at all times command a good view of the bucket line.

The hull is of steel construction throughout, having a length of 160 feet, a width of 40 feet and a depth of 7 feet. Two water-tight longitudinal bulk heads extend from the bow to the stern forming the lower chords of two longitudinal overhead trusses. The upper chords of these trusses are located 13 feet above deck.

Auxiliary trusses are provided inside of the main longitudinal trusses to support the upper tumbler bearings.

A wood deck house encloses the machinery and provision will be made in an upper house for quarterling a crew of 15 men.

The dredge will be electrically lighted from power supplied by the main generating unit and stepped down to a voltage of 32 by a suitable transformer. Lights will be provided for the cabins as well as for the exterior of the dredge to enable the dredge to be operated at night. An auxiliary gasoline driven generator is supplied to furnish energy for the lighting circuit when the main generator is not in operation.

The rear hull compartments between the longitudinal bulkheads will be used as a fuel storage tank and will be of sufficient size to contain a ten day fuel supply. Fuel will be brought aboard the dredge by an auxiliary pump which takes it from the fuel barge astern and deposits it in the fuel tanks on the dredge.

The dredge, under normal operating conditions, will have a dredging capacity of approximately 150,000 cubic yards per month.

The total weight of the dredge in operating conditions will be approximately 900 tons.

This dredge is by far the highest grade machine which has ever been put into the sand and gravel service. The Diesel electric was chosen, primarily, because of the trouble encountered in various rivers with impure boiler feed water. Incidentally, the plant will be much more economical in operation than a steam dredge.

The Kentucky Sand Company, Newport, Ky., has been incorporated with a capital of $60,000.

Active Eastern Trade

Increasing Building Program Carrying Materials Along

By Our Eastern Correspondent

The sand, gravel and crushed stone markets continue active at New York and vicinity. There is a good call for materials and a marked firmness in prices. Producers are making the most of the situation and large quantities of first grade stocks are reaching the city, but there is little attempt to create a reserve, for production is being absorbed rapidly and there is a keen disposition on the part of buyers to secure the material while it is available.

The increasing volume of building construction is making for large increased sales of sand and gravel; both New York and Brooklyn are drawing heavy on the output from the Long Island districts, while New Jersey material is also enjoying ready sale. The road-building programs of state highway departments are calling for thousands of tons of crushed stone, and producers throughout this section are doing their best to keep up with the demand. The New England territory is again assuming prominence in this direction and sizable shipments are leaving the plants.

The price situation is very satisfactory. With an upward trend in prevailing levels, there is a tendency on the part of producers and dealers to hold rigidly to established quotations, and price cutting for large orders is not very frequent. With high production costs, present quotations are justified and the purchaser and prospective purchaser are coming to understand that this is the case. Moreover, with material shortage still a matter of concern, there is every reason to believe that price stability will exist throughout the season.

Good grade sand holds at $1.00 a cubic yard in cargo lots, wholesale. Dealers in Manhattan, Bronx and Brooklyn are pricing the material at $2.00, delivered on the job within reasonable radius. Clean, sharp beach sand is being retailed at $4.50 on the job.

Best gravel, ¾-inch and 1½-inch sizes, continues at a level of $1.75 per cubic yard in carload lots to contractors and dealers. Retail, the prevailing figure stands at $2.75. Prime, washed stock is operating under a good call in the local market.

Crushed stone is selling at the established $1.65 and $1.75 quotations for 1½-inch and ¾-inch sizes, respectively, in wholesale quantities, f. o. b. city. These figures are from 25 to 40 cents under the market prices this same time a year ago. The retail supply yards maintain a $4.00 figure for the material, delivered on the job, and have no difficulty in securing business at this rate.

Portland cement continues to be a feature of the market. There is a big demand for the material and producers are developing full mill capacity to respond to the call. At New York, wholesale prices, less bags, are at $2.40 and $2.50 a barrel, carload lots, f.o.b. Alongside dock, local dealers are paying $2.10. Retail, the best brands are selling for $3.25 a barrel, with standard bag rebate of 10 cents each. While there is sufficient stock to meet all immediate demands, reserves are being drawn upon at the present time.

The lime market shows a plentiful supply of material, with no change in prices during the past month. Finishing hydrate is quoted at $15.90 to $16.80 a ton at the warehouse, while common hydrated stock holds at $12.50. Barreled material, common, is $2.75 to $3.15, and finishing lime, $3.70. The latter material is selling for $4.50 at the supply dealers' yards, and common stock, in standard 300-pound barrel at $3.75. Retail, hydrated finishing is priced at $24.00 a ton, and hydrate common, in paper, $19.50.

The Atlantic Sand & Gravel Co., Lynn, Mass., has been organized under state laws, with capital of $10,000, to operate a local sand, gravel and crushed stone business. John N. Robbins is president, and Paul B. Johnson, 74 Winter Street, Saugus, Mass., treasurer.

The Rockland & Rockport Lime Corporation, Rockland, Me., has organized a subsidiary company under the name of the Rockland Transportation Co., to take over and operate the transportation end of the business. A contract has been placed for the construction of an ocean-going tug and five barges of modern type for the new organization. George B. Wood is president and H. A. Buffum, treasurer.

The Britton Crushed Stone Corporation, Rochester, N. Y., has been organ-

ized under state laws with a capital of $150,000, to operate properties in this district. The company is headed by W. N. and N. W. Britton, and H. P. Rupert. It is represented by G. Y. Webster, Rochester.

A premature explosion of dynamite at the stone quarry of the Belmont-Gurnee Co., West Nyack, N. Y., late in May, resulted in serious consequences, causing the death of four men, who were buried in several tons of rock, and property damage. Other men working in another part of the quarry escaped injury.

The Ralph Gypsum Co., LeRoy, N. Y., is arranging for immediate opera tions on a portion of its properties in the northwestern section of the town. A shaft will be sunk in land on the Griswold Road, and heavy production is expected in this district. Equipment will be installed.

The Federal Cut Stone Co., Brooklyn, N. Y., has been formed with a capital of $10,000, to operate a local yard. The company is headed by J. L. Watson, F. H. Butehorn and R. A. Maclean, all of Brooklyn. It is represented by F. J. Knorr, Albany, N. Y.

The Hilltop Sand Corporation, Brooklyn, N. Y., recently organized with a capital of $15,000, is arranging for the operation of sand and gravel properties in the Queens district. The company is headed by R. E. Slayton, F. S. Johnson and J. A. Burns. It is represented by Caldwell & Polhemus, 150 Church Street, New York.

The National Marble & Slate Corporation, New York, N. Y., is arranging for the erection of a new two-story plant on property recently acquired at 617-619 West Forty-eighth Street. The new works, with site lease, is estimated to cost about $75,000.

The Harrison Granite Co., 200 Fifth Avenue, New York, has arranged for an increase in capital to $446,000 in preferred stock, and 3,600 shares of common stock, no par value, for proposed expansion.

The W. H. Loomis Talc Corporation, Gouverneur, N. Y., has arranged for an increase in capital from $148,000 to $173,000, for proposed plant extensions and general expansion.

The Presbey-Leland Co., Inc., Barre, Vt., operating a granite quarry, has plans nearing completion for the erection of a new plant at Brattleboro, Vt., to comprise a number of buildings for cutting, grinding, polishing, etc., with machine shop and power house, estimated to cost close to $100,000, including equipment.

The State Board of Conservation and Development, Trenton, N. J., is considering plans for taking over and preserving the rock quarry on Mount Pleasant Avenue, West Orange, which has been in active service for more than 50 years past. The quarry is owned by Daniel J. O'Rourke, a son of John O'Rourke, who first worked it, and contains a large quantity of available trap rock. The operations have developed an interesting exposure of basaltic columns, extending along the entire face of the quarry, and of such character to warrant state ownership and preservation.

The Blue Mountain Slate Co., Slatedale, Pa., has commenced the erection of a new slate plant, to utilize material from quarries in this section. Machinery will be installed and operations commenced at an early date.

The Basalt Trap Rock Co., Alexandria, Pa., has been organized under state laws, with capital of $100,000, to operate a crushed stone plant in this section. John Phillips, Alexandria, is treasurer.

The Heimbach slate quarries, near Walnutport, Pa., are being dismanteled and boilers and other operating machinery are being taken to another location. The quarries have been idle for a number of years yast.

The Banner Slate Co., operating the Montgomery Quarry, Lehigh Township, Pa., is planning for enlargements in its quarry, removing a large piece of ground top for this purpose. Additional equipment will be installed and the working force increased.

The J. B. D. Stone Co., Wyoming, Pa., has been organized under state laws with a capital of $20,000, to operate local stone properties. John Drury, West Pittston, Pa., is treasurer.

The Silica Sand Co., Mount Holly Springs, Pa., is increasing operations at its plant, and opening up new property. A recent blast, one of the heaviest ever put off in the Cumberland Valley district, consisted of 20 holes, each 80 feet deep, filled with 5 tons of dynamite. The shot loosened about 21,000 tons of sand.

The Huntington Gravel and Stone Company, Huntington, Ind., has been incorporated with a capital of $50,000. Directors: Richard N. Sampson, George S. Morris, Tully Anson, Walter H. Ball and Howard Shideler.

Most Mills Active

Heavy Output of Cement in Practically All Producing Districts

Heavy production is the order of the day in the Lehigh Valley cement district of Pennsylvania, and every important mill is now on the active list. The spring call for material has exceeded all estimates, and only one or two of the major companies have been prepared with reserves to answer the demand. Storage bins are practically empty at the mills, and with current output just about sufficient for current business, the matter of stocking up must, of necessity, be delayed.

Available labor has diminished to a low point, but no mill, as yet, is experiencing any appreciable shortage in this direction. The coal situation continues fair, and mills with sizable fuel reserves are guarding the supply carefully in view of the unsatisfactory outlook for a settlement of the miner's strike. The spirit of economy prevails in this department of operation.

Shipments are keeping up with production and large trainloads are leaving the district for eastern and other destinations. The car situation is encouraging and no difficulty is being experienced or anticipated in this line.

As intimated in the last issue of PIT AND QUARRY, the local mill base has been advanced from $1.75 to $1.90, and a further increase of 5 cents or more as the season progresses would not be entirely unexpected. The high cost of production holds with a vim, and there is little hope for lower figures during the present year. The increase in wages, as recently decided upon, has gone to intensify the stability of manufacturing costs.

The Atlas Portand Cement Co. is holding at heavy output at its large Northampton mill, and close to the regular working force is now employed. Big shipments are being made to New York and other eastern points, and incoming business for current account is of sizable extent.

The Giant Portland Cement Co., is advancing manufacture at its Central mill at Egypt, recently placed in operation after a long period of idleness. The plant is used for "overflow" business from the Reliance mill, and present indications bear out the statement that both units will be retained on the active list for an indefinite period.

The Coplay Cement Co., Coplay, Pa., is holding to maximum capacity at its Mill C, and other plants of the company are adding to the daily output for immediate shipment. Reserve stocks are low at this plant, and every effort is being made to fill some of the bins.

Other companies now decidedly active in the Lehigh Valley section are the Lehigh Portland Cement Co., the Bath Portland Cement Co., the Hercules Portland Cement Co., and the Alpha Portland Cement Co. Large increases in the working forces have been made at these different mills during the past sixty days, and the outlook holds encouraging for a continuance of operations at full capacity for some months to come.

The mill base of cement at Hudson, N. Y., has been increased from $1.90 to $2.00 during the past month. Other mill prices in important cement districts, carload lot material, without bags, are: Universal, Pa., $1.85; recently advanced from $1.75; Fordwick, Va., $2.10, recently increased from $1.95; Leeds, Ala., $1.85; Kingsport, Tenn., $1.95; Buffington, Ind., $1.80, recently advanced from $1.70; LaSalle, Ill., $1.70, with expected early increase; Steelton, Minn., $1.85, recently increased from $1.75; and Mason City, Iowa, $1.95.

The Edison Portland Cement Co., New Village, N. J., is operating under regular capacity at its local mills, and corresponding shipments are leaving the plant. During the past month, heavy operations have been going forward at the company's quarries, and the working force has been increased.

The Hermitage Portland Cement Co., 174 Third Avenue, North, Nashville, Tenn., is perfecting plans for the remodeling of buildings recently acquired at the Old Hickory plant of the Government in this district for the establishment of a large cement mill. A number of structures will be used for this purpose, completely equipped with machinery for the development of a capacity of about 2,000 barrels per day. A list of equipment for installation has been arranged, and bids will be asked at once. The new works will include a power plant for general operation. The output will be marked as the "Old Hickory Brand" cement. The new plant is estimated to cost about $1,000,000, complete. R. T. Miller is secretary.

Show Sand and Gravel

Eau Claire Company Exhibits Various, Uses of Its Material

Ordinarily it is supposed that sand and gravel are not of much value for "show" purposes.

But here is a show window, put on at Eau Claire, Wis., by the Eau Claire Sand & Gravel Company, which is just as attractive as any industrial exhibit could be made.

Regarding it a local newspaper says:

"The Eau Claire Sand & Gravel Co. owns and operates one of the most modern plants in the United States for the preparation of graded washed and dry sand for industrial uses and sand and gravel for building and construction purposes. Its "Red Flint" sand blast sand is marketed in the several sizes required by the iron and metal trades, and large quantities are sold for use in the production of iron and steel castings. There is also a growing demand for certain grades for special manufacturing and commercial purposes.

"An excellent roofing gravel is found and the clean graded sands are in constant demand for all forms of plastering and stucco work. Street and highway construction and bridges and culverts take a large quantity of the coarse material each season.

"The special high grade industrial products of the company for the metal industries are sold and distributed in a market extending a thousand miles from Eau Claire, a fact which proves there are many valuable uses for the best of so universal a material as sand.

"The plant of the Eau Claire Company is located on the Chicago Milwaukee & St. Paul Railroad across the Chippewa river from Shawtown. It owns 100 acres of land and has twenty million tons of available material in its deposits. Its buildings are all specially designed and the equipment is of the most approved type and fitted to produce the required grades in large quantities at all seasons of the year, clear and absolutely dry.

"Mr. F. H. Nichols is president of the company and A. O. Ayres, general manager. John Stewart is plant superintendent."

The Waterloo Quarry Company, Waterloo, Iowa, has been incorporated with a capital of $12,000. Board of directors: E. C. Litchfield, Lee L. Litchfield, and H. L. Litchfield.

Articles of incorporation have been filed by the Weber Sand & Gravel Co., of Salt Lake City, Utah, with a capital of $5,000. The officers of the company are C. N. Strike, President and treasurer; L. N. Strike, vice-president and W. A. Brown, secretary.

New Michigan Rates

Public Utilities Commission Puts Reduced Scale Into Effect

The Michigan Public Utilities Commission has just handed down two decisions in Docket D-15222, which was an action brought by the Michigan Sand and Gravel Producers Association for a modification of the order of the commission which went into effect in May, 1921.

Their new decision has the effect of reducing the Michigan mileage scale an average of 17 per cent, also to reduce the carload weight from 100 per cent to 90 per cent of the capacity of the car. Taken in connection with the reductions ordered into effect a year ago, this order will reduce the rates on sand and gravel in Michigan to of below the basis in effect prior to the increase of August 26, 1920.

"This is the best decision," says George J. Bolender, executive secretary of the Michigan Association, "that has been rendered by any state utilities commission from the standpoint of the producer. Certainly that is the case as to Eastern territory because in New York and Ohio, the only other states in which drastic orders have been made by the commissions, the rates put into effect were the rates prior to the increase without the establishment of the mileage scale. In Michigan we have accomplished the reduction of the rates to as great an extent as was accomplished in Ohio and New York and in addition we have the benefit of the scales which are as follows:

"First, Uniformity throughout the state; Second, A rate to and from all points in the state.

"Below are the new rates in Michigan, which as will be observed, are to be effective July 1, assuming, of course, that action is not taken by the railroads either before the Interstate Commerce Commission or Michigan courts to suspend the commission's order."

MICHIGAN MILEAGE SCALE ON SAND AND GRAVEL

	Miles	Cents
	10	50
15 and over	10	54
20 " "	15	58
25 " "	20	62
30 " "	25	66
40 " "	30	70
50 " "	40	75
60 " "	50	80
70 " "	60	85
85 " "	70	90
100 " "	85	95

Extra for 2 line, 12 cents and for 3 line, 20 cents per ton. Minimum weight, 90 per cent of capacity of car.

Sands in Foundry Practice

The Bureau of Mines, as one of the Governmental agencies directly co-operating in a general research of all foundry sands, organized by the American Foundrymen's Association and the National Research Council, is collecting data on sands for molds and cores in aluminum-alloy foundry practice.

There is pressing need of collated information on sands used in aluminum-alloy founding, and it is hoped, as a result of the investigation, to aid in disseminating knowledge on the subject. A questionnaire is being sent by the Bureau of Mines to aluminum-alloy foundries in the United States in order to obtain data to be used in the preparation of a report. It is possible that some foundries of this kind are not upon the bureau's mailing list, and it is hoped that any such plants that do not receive the questionnaire will apply for one. While the replies to the questionnaire will be summarized for publication, the contents of individual communications will be held strictly confidential. Communications in regard to the matter should be addressed to R. J. Anderson, metallurgist, U. S. Bureau of Mines Experiment Station, Pittsburgh, Pa.

The Rockland & Rockport Lime Corp., Rockland, Maine, has placed an order with a New York shipbuilding concern, for the construction of an ocean-going tug and five barges of the most modern type. A corporation known as the Rockland Transportation Co., has been organized with Geo. B. Wood as president and H. A. Buffum as treasurer and clerk.

County Lime System

Indiana Localities Have Effective Method of Test and Distribution

W. A. Ostrander, associate in soils at Purdue University, related before the executive committee of the National Agstone Association recently the manner in which some Indiana counties are handling agricultural limestone.

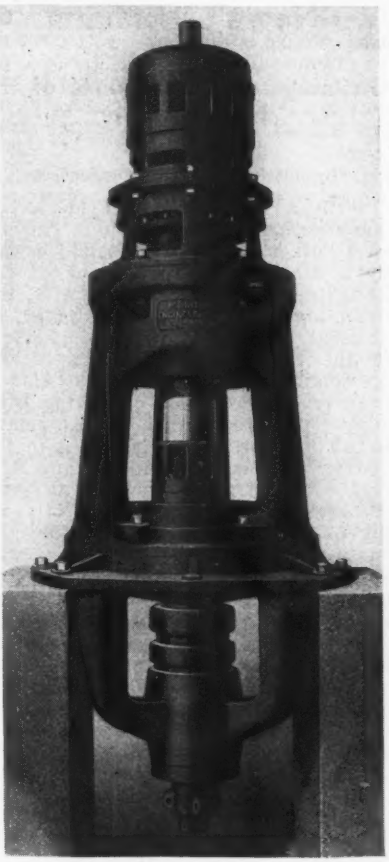
Each county agent makes a large map, about 3x4 feet, of his county, sketching in the township and section lines, and pastes on this map the lead acetate papers from his soil acidity tests, placing them in the location where they received with the man's name under them. This gives the farmer a quick comprehensive idea of his county as to the need of limestone and it also gives him a means of knowing whether he needs it on his farm or not from tests made on farms near him. After this is done a survey is made to find out where the limestone has been used and the results obtained. This, then is put out through the press, and about the same time meetings are held in townships tributary to shipping points and a survey is made of the men present regarding the amount of limestone they will use in a year's time. This total tonnage then is taken to a local dealer and a lime bin arranged for at that shipping point.

"We are thoroughly convinced of the fact that when men can get limestone at any time and can utilize their slack days in hauling it they will use it," said Mr. Ostrander. "Furthermore, after we have the lime bin established we put out signs on every main road out of town calling farmers' attention to the fact that he may be going home with an empty wagon when it could be full of limestone."

New Secondary Crusher

Crushed stone people and gravel operators having oversize gravel to crush, will note with interest the announcement of the Weston direct drive gyratory crusher for rejection or secondary work which is being manufactured by the Morgan Engineering Company of Alliance, Ohio.

The crusher is designed as a rejection machine for following primary



crushers and reducing oversize hard rock or ore. All parts of the machine subject to wear are inexpensive and replacable with a minimum of work and time. The motor is mounted in a vertical position and connected direct to eccentric by flexible coupling. In cases where electric current is not available, belt or rope drive may be used from line shaft or other sources or power.

Dust is absolutely prevented from entering into the eccentric and pivot bearings. The eccentric is oil floated and the pivot bearing will give long life without rebushing. The eccentric pumps its own oil without accessory pumps, gears or pipes at the rate of several gallons a minute with positive certainty, and furnishes as well the flow of oil for pivot bearing which is regulated by needle valve and sight feed.

News of Indiana

Gleanings from All Parts of the Hoosier State

By Our Indianapolis Correspondent

With a flat car rigged up as an "observation Pullman" and a caboose as a "diner" and the "special" drawn by a dinky engine from one of the Bloomington, Ind., stone quarries, the Bloomington Rotary Club enjoyed an unusual trip recently. The members of the club were the guests of the president, Harry Johnson, who also is head of a large stone quarrying company. The special took the Rotarians to the Johnson quarry, which is in the district between Bloomington and Bedford. The trip was one of a series of observation tours the club is making to various industries. Before the summer is over the Rotarians will have been to every quarry in the district and will have become acquainted with the method of work in each plant. A lecture and dinner is to be given at each factory, quarry or mill.

The Romona Stone Products Company, of Owen, Ind., has filed a final certificate of dissolution.

The Henderson Sand and Gravel Company at Evansville, Ind., has added to its fleet the tow boat Marie J., from Vicksburg, Miss. The new addition to the fleet is 125 feet long with a 25-foot beam. Capt. Charles Smith, of Evansville, will take charge of the boat.

The Indiana public service commission will be asked immediately to issue an order requiring the Winona Electric Light and Water Company to sink wells at the Winona gravel pit and install pumping machinery and lay mains adequate to supply the needs of Warsaw, Ind., with water from that source. An analysis of the water in the pit shows it to be free from iron. Engineers say that this generally is true of water in such pits, giving a hint as to the future water supply of other cities in Indiana.

The Ohio and Indiana Stone quarry at Greencastle, Ind., recently fired 15,000 pounds of dynamite in one shot and moved about 44,000 tons of stone. Thirty-six holes were drilled to a depth of 75 feet and the shock was barely felt in the city itself.

Attorneys for the two Bedford stone organizations in Southern Indiana and fifteen of the seventeen affiliated companies and individuals in Indianapolis, Bedford, Bloomington and Elletts ville, named as defendants in an anti-trust injunction suit brought by U. S. Lesh, attorney-general in superior court in Indianapolis, have filed four demurrers to the suit, setting forth reasons why the suit should not be sustained. The Hoosier Cut Stone Company and the George Doyle Corporation, both of Bedford, two of the seventeen affiliated concerns, were not parties to the demurrers, but they filed a separate motion to have the complaint made more specific. Paragraphs of the demurrers say the various paragraphs in the complaint did not present facts that would justify the interference or conclusion that the companies and the organizations were attempting to destroy competition and thereby restrain trade. Separate demurrers were filed by the auxiliary and by the International Cut Stone Contractors' and Quarrymen's Association, Inc. Fifteen of the companies named joined in one demurrer, and they and the two organizations filed the fourth demurrer. The allegations in each demurrer were practically identical.

Articles of incorporation have been completed and will be filed shortly for the Huntington Gravel and Stone Company. The home office will be in Huntington, Ind., and the company is the second of its sort to organize just recently in this city. The capital stock is placed at $50,000 with 500 shares of $100 each. One entire farm already has been purchased for the gravel rights. The incorporators are Richard N. Samson, George S. Morris, Tully Anson, Walter H. Hall and Howard Shideler. The first annual meeting is to be held soon. The company already has under lease and through direct purchase several hundred acres, from which millions of yards of gravel can be taken. The gravel bed lies along the Wabash railroad and an interurban line and switches will be extended to the plant. The larger stones will be crushed.

The plant of the Bloomington Stone Crusher Company was destroyed by fire recently with a loss of $15,000. The company is located at Bloomington, Ind. The plant was insured for $6,000. The fire was caused when an acetylene torch broke and the gas in it caught fire. Two employes were

badly burned. The company had been putting in a new crusher and other equipment. The plant was owned by Ralph Rogers, A. F. McCormick and John J. Campbell. It will be rebuilt. Crushed stone for road building is manufactured.

Articles of incorporation and notices have been filed with the secretary of state for Indiana which show the organization of a new stone and stone products company at Ellettsville, Ind., with a capital stock of $15,000. The company is incorporated under the name of Harding & Coswell, both of Ellettsville. The directors are P. M. Coswell, Clara Harding and William C. Reeves.

Active Production

Good Demand Reported from Pittsburgh District

All of the large sand and gravel companies in the Pittsburgh, Pa., district are maintaining active production, and there is a good firm demand for material. The river is in daily use with tows of sand, gravel and stone for the Pittsburgh market, and sand-diggers are engaging actively at different points along the stream.

Good washed gravel holds at $2.00 a cubic yard, delivered on the waterfront, while a figure of $1.60, f. o. b. float, prevails for quantity business. Delivered stock ranges from $2.50 to $3.00 a yard. River sand shows no change from a $2.40 per cubic yard level. There has been a decline in crushed stone quotations during the past month, and the material is now priced wholesale at $2.85 a cubic yard, against a previous figure of $3.25, both for ¾-inch and 1½-inch stocks. The local supply yards are asking $4.50 upwards for delivery on the job. Portland cement maintains at $2.00 a barrel wholesale, without bags, in cargo lots, while dealers are quoting $2.80 for delivered cement.

The Rodgers Sand Co., reports a marked increase in demand during recent weeks, and heavy production is being maintained at the company's dredges in the Fourteen-Mile Island district. This island, owned by the company, comprises sand and gravel beds equal to any in the state. J. H. Rodgers is head.

The Keystone Sand Co. is busy at its properties on Neville Island, and the towboat "Victory" of the company's fleet is making daily trips to the Pittsburgh port. Sand and gravel are also being secured from the Coraopolis district.

The J. K. Davidson & Brother Co., Pittsburgh, has inaugurated an extensive improvement and expansion program, and looks forward to a record-breaking year for production and sales. The company has recently placed twelve new steel barges in commission, each of 600 tons capacity, and is considering the purchase of another fleet of this same size and character. Equipment and facilities at the Northside plant of the company on River Avenue will be increased to triple the present capacity. The heavy demand for stock has depleted the large reserve tonnage usually carried at the Aspinwall storage plant of the company.

A number of Indiana sand and gravel producers have asked the state association that effort be made to induce the maintenance department of the State Highway Commission, and road superintendents, to use graded gravel between ½ inch and ⅛ inch in size for top dressing of gravel and stone roads. This material has been found to give excellent service wherever used.

The Public Service Commission of Indiana is cooperating with the Public Service Commission of Illinois in formulating a way to remove the Federal injunction now hanging over both commissions in regard to freight rates intrastate.

The plant of the White Rock Silica Sand Co., Strasburg, Ohio, which has been inactive for the last two years, has resumed operations recently. Considerable new equipment has been installed. Mr. Wm. Crone is president of the concern, and George A. Evans is treasurer.

The East End Sand & Gravel Co., Chillicothe, Ohio, has begun the construction of a graded gravel bin of 400 tons capacity daily. A power plant is being installed, also, which will enable this concern to handle 400 tons of gravel daily.

Kentucky Prospering

Several Favorable Factors Combine to Make Good Business

By Our Louisville Correspondent

The building boom is going some in Louisville and gives every promise of keeping up its lively pace all summer. The building records so far compare favorably with cities two and three times the size of Louisville, and lately plans have been announced for several million dollars worth of new structures of the kind that call for lots of sand and gravel. The plans include a new hotel to cost four million, a million dollars worth of school buildings, a new million dollar Elks home, a new Masonic Widows and Orphans home to cost above a million, churches, hospitals, and a million dollars worth of sewer work if the commission and the contractors can get together on it.

The sand and gravel people are not only getting the benefit of the local building boom, but with an easing in freight rates to help some, and the state as a whole prospering unusually because of the coal strike in other states while mines are going full here, the outlook for the carlot trade to dealers shows up brightly too. The only fly in the ointment is some fear of railway strike troubles, but so far this has not dampened the ardor much, and all are cheerful and hopeful.

R. B. Tyler says that the reduction in freight rates is not enough to encourage immediate activity in the commercial trade in crushed stone, or ground limestone, therefore his big quarry here is still idle. They are busy on road contract work, though, and are running their quarries connected with road operations. Also those quarries in the state doing railway ballast work are busy. So far, though, there is not much stirring in the general commercial line among the crushing plants. There are more road lettings this month and these are of interest.

The season is not only proving good for road contractors, and for the river sand and gravel people, but the cement mill in this territory have a good call now, too. And the dealers in concrete mixers, truck-tractors and other equipment are having a good run of trade.

The Roy C. Whayne Supply Co., for example, has had a good run of trade all around, and is still hustling. Batch mixers seem to have been in big demand all spring, while trucks and tractors have been going some too. In short it is pretty busy days all around except in the general commercial crushed stone business, and even this is looking more hopeful.

W. M. Holland, superintendent of the New Albany division of the Indiana State Highway system, New Albany, Ind., as arranging to open three new stone quarries and equip them with crushing plants. Quarries have been opened at Fredericksburg, Louisville and Edwardsville, and with three additional plants he figures they will have a crushing capacity of 500 yards a day.

Fuller's Earth in 1921

The output of fuller's earth in the United States in 1921 was 105,609 short tons, valued at $1,973,848, according to the United States Geological Survey, Department of the Interior. The quantity decreased 18 per cent and the value 21 per cent as compared with 1920. In 1921 the average value per ton at the mine was $18.69; in 1920 it was $19.51. Fuller's earth is found in many States, but in 1921 it was mined only in Alabama, Arkansas, Florida, Georgia, Massachusetts, and Texas. Florida has been the leading State in production ever since the industry was established in this country, in 1895, and in 1921 it made 54 per cent of the total output. Georgia and Texas were second and third, respectively in output and value.

The imports of fuller's earth in 1921 were 9,744 short tons, valued at $119,415, a decrease of 49 per cent in quantity and 46 per cent in value as compared with 1920, and the lowest quantity since 1900, and only a little more than a third of the maximum, which is credited to 1914. The average value per ton of imported earth at the principal markets of the country from which it was exported was $12.26 in 1921 as compared with $11.54 in 1920.

The Utah Quarries Company, Twin Falls, Idaho, has been incorporated with a capital of $100,000. Directors: J. E. Workman, L. E. Dunning, and E. V. Berg.

What Is Depreciation?

Uniform Practice Suggested by U. S. Chamber of Commerce

A plan to assist manufacturers in the different lines of industry in determining depreciation for tax purposes has been worked out by the Fabricated Production Department of the Chamber of Commerce of the United States. Use of this plan is being urged by the department.

The plan provides that "within the trade association of a given industry a depreciation committee should be appointed, consisting of from five to seven engineers, cost accountants and plant superintendents selected from the industry.

"Such a committee should prepare a questionnaire providing for a listing of the units of utility, the cost of same, estimated scrap value, and years of useful life.

"Before sending the questionnaire to manufacturers of a given line certain preliminary points should be cleared up, such as:

"A. Method of charging maintenance, renewals and depreciations: It will not do merely to average the various estimates of useful life provided by the manufacturers of a certain line, because the methods of charging maintenance, renewals and depreciation may not be the same. Thus, one manufacturer may charge as maintenance all repairs and partial renewals. By this method the laying of a new roof on a building would be charged maintenance. Another manufacturer may charge to maintenance only such items as tend to keep the property in the same general condition. The laying of a new roof adds to the life of the asset and accordingly would be charged to the depreciation reserve. The first method gives a high maintenance rate and a low depreciation rate. The second method gives a low maintenance rate and a high depreciation rate.

"B. A statement of elements of depreciation: Accompanying the questionnaire should be a statement of the elements entering into depreciation, wear and tear, and obsolescence.

"Wear and tear is defined as 'that uniform wear-out and decay which repairing is unable to check' and it is dependent upon the amount of use, the amound of care, the quality of the installation and the natural hardships to be overcome.

"Obsolescence arises from "an inability to compete in kind, in quality or in cost of desired results with later forms of the same utility.' Also there is that change in demand which displaces the whole life of equipment.

"It is important that the depreciation committee secure sufficient facts for it to come to a conclusion as to which is the factor, obsolescence or wear and tear, determining the useful life of a given unit of utility. Certain machines are not given the opportunity to wear out, they are replaced so rapidly because of improvements in the art. Clearly obsolescence is here the determining factor.

"C. Determining stated conditions of use: Guide rates of depreciation for an industry presupposes stated conditions of use,—the number of days of operation in a year, the number of hours of operation per day, a standard of maintenance, external conditions such as climate and road, etc.

"With the normal conditions of use stated, it will be possible to provide for variances thereof upon a scale of percentages. Thus, during the war additional rates of depreciation were allowed for overtime operation, and when depreciation can be based on an incident of production, capacity, or performance, it may be feasible to scale the rate of depreciation for subnormal production.

"Upon a return and digest of questionnaires, schedules should be prepared showing items of utility, cost, scrap value, and useful life. These schedules should be submitted to the manufacturers for criticism. Upon revision a conference should be arranged with the experts of the Treasury Department that the depreciation date may be checked by them.

"When so checked the rates of depreciation should be promulgated as guide rates for the industry, it being thoroughly understood that such depreciation rates shall be merely suggestive and not mandatory and that in the last analysis such concern must determine the depreciation allowance out of its own individual experiences."

The Decatur Sand & Gravel Co., Decatur, Ill., has incorporated with a capital of $150,000. Incorporators: H. M. McMillen, J. H. Donaldson, Frank Kincaid and W. F. Montgomery.

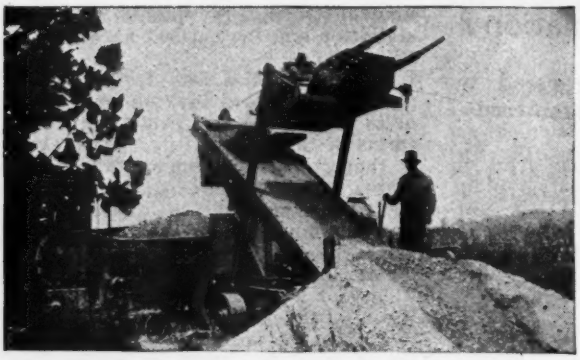


Fig. 1. Smith Excavator and Loader Delivering Load Direct to Truck

Larger Motor in Smith Excavator and Loader

The consistent service provided by the Wisconsin four-cylinder gasoline engine used on Smith pavers has led to the adoption of this make of motor on Smith excavators and loaders, made by the T. L. Smith Company of Milwaukee. This motor has 3-inch bore and 5-inch stroke, runs at 1,200 R.P.M. and provides about 40 per cent additional power over previous equipments.

A recent installation of this new-motored machine is shown in the accompanying illustrations — figure 1 giving a close-up view of the excavator and loader, owned by Contractor Henry Westerman of Mt. Healthy, O., and figure 2 showing the skip after having delivered its load to the truck, returning from the excavator a distance of 110 feet in 9 seconds.

Fig. 2. Skip Returning from Excavator, a Distance of 110 Feet, in 9 Seconds

Remaining always on the surface, excavating and pulling the earth to it, then loading it directly into truck or wagon, the Smith excavator and loader gives efficient time — saving service, meeting the requirements of every type of excavation work.

New ¾-Yard Shovel

The Bucyrus Company of South Milwaukee, Wis., has just announced a new 20-ton, ¾-yard revolving shovel to be known as the 20-B. This shovel replaces the 14-B revolving shovel so long and so favorably known.

From boom point to ash pan, this shovel is a distinctly new design. For four months this machine has been under test and on actual work.

In general the design follows along the lines of the Bucyrus 30-B universal shovel, its bigger 1-yard brother. It is a universal machine, being adaptable to dragline, high lift, sewer, clam shell, crane and other combinations.

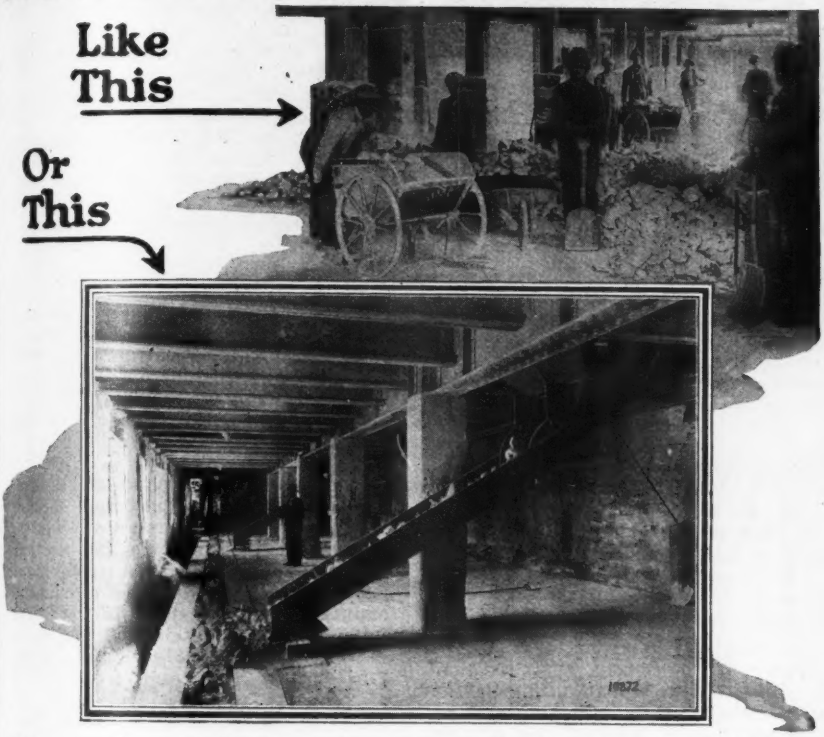
No effort has been spared to design every detail of this machine, so as to make it easier to operate and more convenient to maintain than previous steam shovels of this size.

The 20-B is a superior dragline excavator. The arrangement of the machinery makes possible a straight lead for the drag rope. The fair lead affords a vertical as well as a horizontal lead to the rope, it reduces friction and rope wear to a minimum. The standard equipment is a ¾-yard bucket and a 35-foot boom.

The 20-B is extremely useful for work also as a crane or clamshell machine.

Another unique feature of this machine is the use of electric steel in the smaller castings, making possible the economic distribution of material. In strength and power this machine is a real Bucyrus.

How Do You Handle Lime?



Above—the old-fashioned system of drawing the kilns by hand, piling the lime on the floor, and carting to crushers or cars in wheelbarrows.

Below—the modern and up-to-date Link-Belt method (part of our equipment furnished the Riverton Lime Co., Riverton, Va.), where the lime is handled by machinery from the kilns to overhead storage bins, and thence to shaker screen, which delivers to crusher, box car loader, or barrels, all with a minimum of labor, expense and increased output.

Let our engineers suggest a layout for your plant.

LINK-BELT COMPANY

CHICAGO—300 W. PERSHING ROAD
PHILADELPHIA—HUNTING PARK AVE. AND P. & R. RY.

LINK-BELT

Equipment Engineers

Mr. Louis Falzer, formerly general manager of the Thomas Elevator Co., Chicago, and Mr. Edwin M. Webber, formerly district manager of the Wagner Elec. & Mfg. Co., at Detroit, have established the firm of Falzer & Webber, equipment engineers, and maintain offices at 500 N. Dearborn St., Chicago.

The firm will furnish a service to the prospective sand and gravel producers, as well as those already established, that will be very valuable to them. The scope of the service will be in making layouts, recommending the proper equipment, buying advantageously for their accounts, expediting delivery of the materials and supervising the construction of the plant.

With Victor Balata Belting

Mr. Mark Kaplan, formerly manager mechanical rubber goods department of Geo. B. Carpenter & Co., has associated himself with the sales department of the Victor Balata & Textile Belting Company, Chicago.

Mr. Kaplan's long and successful experience in the belting business qualifies him to take up all problems that arise covering the application and recommendation of belting. He also enjoys a wide acquaintance among distributors, jobbers and consumers.

Sauerman Bros., 312 South Dearborn Street, Chicago, have recently issued two new bulletins—No. 16 describing Sauerman power scrapers, and No. 17 describing Sauerman dragline cableway excavators. An interesting feature of the latter is an aeroplane view of sand and gravel plant showing a Sauerman cableway excavator in operation. Both bulletins are also fully illustrated with actual operations together with valuable descriptive matter. Either one or both of these bulletins will be sent on request.

A new bulletin—No. 26—has recently been issued by the Anderson Foundry & Machine Co., of Anderson, Ind., describing and illustrating the Anderson oil engine. The book is devoted largely to illustrations of these engines in actual operation, and testimonial letters from the users, including a number of pit and quarry operators.

Moore & Moore, Reading, Pa., are offering to the trade, manganese steel castings, produced exclusively by the electric furnace process. By this process it is possible to control the percentage of manganese in these castings, as well as turning out a casting in which the various elements are equally distributed. The company also produces manganese sprocket chain and attachments therefor. This company states that it belongs to no price fixing organization, and is therefore in a position to quote prices in exact accordance to cost.

Orton & Steinbrenner Company, manfacturers of locomotive cranes, grab buckets and coal crushers, have moved their offices from the 11th to the 19th floor of the Transportation Building, 608 South Dearborn St, Chicago.

Endurance tests of storage batteries for use in permissible mine locomotives, made by the Bureau of Mines at Pittsburgh, Pa., indicate that the battery cells at present supplied for mine locomotives have sufficient mechanical endurance to withstand the ordinary jolts they are likely to receive in service. It appears probable that no great hazard will result from the use of properly installed and cared for batteries in permissible locomotives.

Walter J. Evans has been appointed manager of the Philadelphia sales office of The Webster Manufacturing Company with headquarters at 719 Commercial Trust building.

The Northwest Engineering Company of Green Bay, Wis, manufacturers of crawler cranes and draglines, announces the removal of the general sales offices to 1220 Steger Building, Chicago. Mr. W. W. Mutter vice president, has assumed active charge of this office. Activity in the fields reached by the Northwest organization has increased to such a degree that it has been found necessary to operate nights at the Green Bay plant to supply the demand for Northwest products.

Articles of association have been field by the Michigan Gravel & Gypsum Co., Aldrich Bldg., Grand Rapids, Mich., capitalized at $10,000. Fred B. Aldrich, president, Edw. M. Deane, vice-president, P. A. Hartesvelt, secretary, and Clifford A. Page, treasurer.